

V.V. K o v a n o v

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**IN  
THE NAME  
OF  
LIFE**

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Reflections  
of  
a Soviet Surgeon

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Portrait of the author

V.V. K o v a n o v

Vice-President of the USSR Academy  
of Medical Sciences

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## INTRODUCTION

*In recent years a whole spate of memoirs have appeared, written by people in different walks of life including generals, industrial engineers and workers, aircraft designers and prominent public figures. But so far there has been little written by members of the medical profession. There have been just a few books describing the lives and careers of prominent medical men and giving an insight into the character formation of people who have dedicated themselves to the noble task of safeguarding the health of their fellow-men.*

*So I decided to attempt writing such a book on the basis of my own life and career and those of my fellow-students, colleagues and teachers from whom it has been my good fortune to learn so much and for whose help I am deeply grateful. I was fully aware of the complexity of the task and of my lack of literary experience. Nevertheless I decided to have a go. My generation of medical men and women began their careers in an unforgettable and momentous period in the history of this country. Those were the stirring years in which the world's first socialist state was being made. The Revolution of October 1917 opened the doors of schools and universities to millions of young people from workers' and peasants' families. It was Soviet power that gave us an opportunity to get a free education and later to apply our knowledge and*

*energies in the field of our choice. I believe it my duty to tell today's younger generation all about it.*

*Learning came hard to us, but the thirst for knowledge helped one to overcome the many difficulties. The young people of those days were fired by enthusiasm generated by the great revolution and by the prospect of creating a new world. Every aspect of the countrywide effort affected us in a most immediate way and was a matter for personal concern. The life of the Party and the nation was our life and my generation advanced with the country's advance.*

*I am deeply grateful to my teachers, eminent men of the medical profession, who after the Revolution took the side of Soviet power and served it with dedication to the end of their days. It was they who helped mould a new intelligentsia, a Soviet intelligentsia that sprang from the midst of the working people. In this book I have attempted to give the profiles of M.P. Konchalovsky, P.A. Herzen, A.I. Abrikosov, N.N. Burdenko, A.V. Vishnevsky, S. S. Yudin and some other medical scientists and practitioners. My book is also about those with whom I worked side by side at different periods of my career and with whom I shared the joys of achievements and sorrows of failures—fellow-students, doctors, nurses and orderlies.*

*The war against nazi Germany left an indelible imprint on the memory of my generation and certainly found place in this book. The grim days of our retreat before the nazi hordes in the opening phases of the war, the death of friends, the terrible destruction and finally the joy of our hard-won victory—all these are still fresh in my memory.*

*Naturally enough my own field, surgery, as well as the more general aspects of medical science, its current problems and prospects have been given considerable space in this book.*

*I shall feel I have achieved my aim if this book conveys to the readers some of my devotion to medicine and arouse in them an interest in and respect for the noble profession of a doctor.*

V. Kovanov

# THE BEGINNING

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## I. AN ADULT CHILDHOOD

*The working people yearn for  
knowledge because they need it for  
victory.*

*V. I. Lenin*

### **The Early Years**

As I look back on my childhood and adolescence I find that my memory has retained only the bright episodes, which left a deep impression on my boyhood imagination. Inevitably, my memories present a variegated and scattered pattern and it is difficult to piece together a neat and well-ordered picture of my early days, but even so these fragmented memories enable me to relive my childhood if only briefly.

I remember how, for instance, when I was still an adolescent an incident occurred that was fated to influence the whole of my subsequent life. It happened in my home village of Ichalki in Nizhni Novgorod Gubernia. One Saturday afternoon my friends and I took a herd of horses out to the pastures for a night's grazing. We were to shepherd the horses all through Sunday. At night some of the boys wrapped themselves up in their fathers' sheepskin coats and were having a comfortable shut-eye. Others, who felt wakeful, whiled the time away fishing. We were fairly confident that the horses would not stray too far: the pastures were in a vale sandwiched between the river and the forest. The next morning a herd of cattle led by a huge fierce-looking bull was driven past us on its way to a watering place. Suddenly, without warning, the bull stopped, gave a blood-curdling bellow and charged a group of horses. Before we knew where we were the bull gored a young colt.

The next moment, Orlik, as the colt was called, was prostrate on the grass with a ghastly gash in his belly. The boys armed with long sticks chased the infuriated bull away. We did not know what to do about Orlik, who was lying on his side panting heavily, his legs stretched out, his revaged belly twitching and quivering convulsively. His eyes were wide open and looking at us in indescribable anguish. The older boys thought the best thing was to kill him to take him out of his misery. My cousin Misha, however, said that we must fetch Nikolai Yakovlevich Martynov, the local veterinary surgeon who lived in a neighbouring village a few miles away. In a moment Misha was on horseback and galloping away. In the meantime we formed a circle around the poor Orlik. Someone brought an old sack which we tied around the colt's belly to prevent the intestines from falling out completely. The surgeon arrived post-haste, examined the victim carefully praising us for our resourcefulness. Then he asked us to help him transport the wounded Orlik to the village.

Aunt Dunya, Misha's mother, boiled a pail of water, brought a basin and a few clean towels. Nikolai Yakovlevich washed his hands and put on a white coat. With the ease of long practice he first hobbled Orlik and then, using a technique of which we had never heard, got the colt down on his side. Then he looked at the frightened lot of us and said, "Anyone willing to lend a hand?"

One of the boys pushed me forward. Nikolai Yakovlevich smiled and told me to go in and wash my hands with soap. Then he helped me into a white coat and together we began rinsing the colt's intestines in a basin of warm water heavy with the smell of some medicine or other. Before working the intestines back into place Nikolai Yakovlevich widened the gash telling me to hold the intestines with both my hands. The intestines kept slipping between my trembling fingers. Then Nikolai Yakovlevich produced a vial out of his pocket and held it close to the horse's nose for him to sniff. The intestines stopped falling out of the gash and the surgeon proceeded to sew up the belly. I helped him to the best of my ability.

The operation over and Orlik's belly swathed in a lot of bandages, he struggled back on his legs rather hesitantly, shaking all over. I watched the proceedings spell-bound. I was tremendously impressed by the power of the doctor. Death which had seemed inevitable only a short time ago had beat a retreat.

Later, whenever Nikolai Yakovlevich met me in the village, he invariably greeted me with his smiling, "Well, my little surgeon, how are we today?"

Autumn came and many of the boys from our village began leaving for school. Some went to Arzamas, others to Murashkino. My elder brother Pavel went to the Dalneye-Konstantinovo village where he attended the 8th form at the local school.

Pavel had repeatedly suggested that I go with him but I declined the offer. I did not relish the prospect of leaving my sick mother behind and in any case life in the village was very much to my liking. But after the incident with Orlik, Pavel decided to try other tactics. He simply told me that Nikolai Yakovlevich told him in strict confidence that I had considerable talent for surgery. And in order to become a surgeon it was necessary for me to go to school. I was taken in by the ploy. Before long we got a horse-drawn cart and set-out.

During that journey I had enough time to think back to my early childhood and the stories my father had told me. When he was sixteen, he left his home village for a river port on the Don to work as a stevedore. Nature endowed him with considerable physical strength. He could pick up huge sacks and carry them across the shaky gangways with perfect ease. When he was eighteen he was called up and served in the ranks. His impressive stature and perfect physique earned him a place in the élite Preobrazhensky Regiment in St. Petersburg. After his army service Father decided to stay on in the capital. He had no qualifications and so took a job of a labourer. His subsequent life was one of endless toil and privations.

The First World War came and Father was back in the army. My mother was left with five children to look after. We lived in a cramped little room under the landing in an old house owned by a merchant. To this day I remember the foul-smelling dark green sludge that kept seeping between the old floor boards. In the morning before letting us out of our beds Mother would mop up the sludge and open the window to get some fresh air into the room. After helping us into our clothes and giving us a hasty breakfast she hurried away to the backyard to a little basement laundry. Mother did all the laundering for the occupants of the house. We would often pop round to watch her work. I can still see her in my mind's eye, bent over the steaming wash tub, barefooted, with the hem of her skirt turned up slightly. Without stopping her washing, Mother would give us a tired smile and tell us to go back into the courtyard to get some sun.

1917 came and the streets of Petrograd were thronged with people. It was not until many years later that I was to understand the full meaning of the events that unfolded in Petrograd and in

fact throughout Russia at that time. After the February Revolution the Bolsheviks were preparing the masses for the overthrow of the Provisional Government. But at the time, being just a boy, I just sensed the general atmosphere of excitement and change.

In the evening Mother often left the house to attend meetings of workers. Alongside other working women she joined demonstrations to demand an end to the war, that brought nothing but suffering and privations, and immediate return of their husbands from the front. In those days Mother was active in urging other women to attend meetings, distribute leaflets and disseminate propaganda against the war and against the policy of the Provisional Government. She herself listened with rapt attention to the speeches at the many meetings she attended trying to work out the meaning of the momentous events taking place in Russia in those days.

On the eve of the October Revolution, Mother, defying the risk, helped Alexei, my elder brother, who worked at the Westinghouse plant and who was a member of the Red Guard, by hiding rifles and ammunition in the house. Little did she know at the time that soon the whole world would hear the historic announcement by Vladimir Lenin: "Comrades, the workers' and peasants' revolution, about the necessity of which the Bolsheviks had always spoken, has been accomplished."

In those days our little room under the landing was a meeting place for wives and widows of soldiers at the front. Some women came to Mother to seek comfort and consolation after receiving the sad news that their husbands were missing or killed in action. Others brought their problems to her: usually that there was not a crumb of bread left in the house for the children. Still others sought advice about what to do: the employer had found out that they had attended Bolshevik meetings and threatened dismissal. Mother always found an encouraging word of hope, though herself was in no better position: her own husband was in German captivity and her elder son Mikhail was at the front daily exposed to death. To make things worse, she developed a serious heart condition brought on by frequent attacks of rheumatism, and she was long past her prime. Her face was haggard and had the high colour of fever. In fact, there were days when she could hardly drag her swollen legs.

One day, apparently unable to take it any more, Mother decided to go back to her home village. In those days it was easier said than done. Railway traffic was chaotic and such trains as were still running made long stops on the way to stock up with water and firewood.

At last we reached our destination. Hungry and weary from the journey we emerged from the coach at the Pyansky-Perevoz junction. There we got a lift from a cart driver to Ichalki village.

It was a grey autumn day when we arrived and the reception we got was anything but warm. Grandfather Fyodor did not even bother to come down the steps to greet the wife of one of his sons and his grandchildren. Overgrown with shaggy hair, wearing a long coarse shirt, he planted himself at the top of the porch and hurled unkind and hard-hitting words at us, speaking loudly enough for all the neighbours to hear, "So you are back then, are you? What's the good news of life in the capital? You didn't like it much by the look of you. You'll have to fend for yourselves, don't expect me to saddle myself with the lot of you".

After a while he relented and let us into the house. Later, when we were seated round the table he resumed his grumbling and nagging: "Look at the starvelings! I haven't got any food for you. I suppose I can give you a strip of my rye field for a start. Ask for some land from the community and work it yourselves. You'll eat what you reap."

Our first winter in the village was hard, cold and lean.

The summer of 1918 was a real scorcher. The spring crops, the wheat, the oats and the millet, all turned yellow and dried up before they had a chance to ripen properly. Luckily for us, the winter-sown rye survived the heat and ripened on time.

The villagers started the job of harvesting with the first light of day. By mid-day the fields would be lined with neat, straight rows of sheaves. Only our part of the field presented a sad sight. The fact was that my mother had become unused to field work after living many years in the city and in any case she was not strong enough to cope with the hard work. Nor could we be of much help. I was nine, Pavel eleven, only Nikolai, sixteen, was old enough to be of any help. Two of my elder brothers were at the front: Mikhail was with the Lettish Riflemen fighting in the Urals against Kolchak's armies while Alexei was with the defenders of Petrograd.

To begin with, our neighbours were rather unkind to us and often laughed at our inept efforts to harness a horse, to plough or to wield the scythe. Nikolai took the ridicule to heart more than any of us.

Then something happened that changed the villagers' attitude. On that day the sun was up and blazing down hard. We were all

out in the field reaping our rye when we heard the sound of the alarm bell. The field was atop a hill from which one had a perfect view of the village below. When we looked round we saw that several cottages huddled together in the centre of the village were ablaze.

At the sound of the alarm all who were in the fields harvesting dropped their reaping hooks and tore towards the village, some on horseback, others on foot. Clouds of dust raised in the road made it impossible to see anything. We could only hear the sound of running feet, the clatter of horses' hoofs and the swish of whips lashing the horses.

When we reached the village, the fire was raging like mad. Everything around us seemed to be burning, the cottages, the outhouses, the fences. A high wind was up helping the flames to leap from one house to another. The villagers half-crazed were dashing about trying to salvage what they could from the blazing inferno.

Someone brought icons. Old men and women went down on their knees pleading with God for mercy. But their prayers apparently went unheard and the conflagration kept spreading. Suddenly I caught sight of my brother Nikolai who together with some other men armed with boat hooks was pulling apart a burning house to prevent the fire from leaping on to the neighbouring wooden structures. At one point Nikolai's shirt caught fire, someone poured a pail of water over him and he dashed into the fire again. Before long, the dare-devils were joined by other villagers. The fire, after hitting a vacuum, began to die down.

When Nikolai came home that evening he had many bad burns. Mother put wet towels on them, looking on her son with pride and admiration. I too felt very proud of my elder brother. After that fire the villagers became much better disposed towards us. So much so that whenever we fell behind the others in harvesting young girls and lads came to our strip to lend a hand. Our neighbours helped us in other ways too.

A year later, in the summer of 1919, when Father returned from a German POW camp, our little farm was getting on its feet.

As time went by, the winds of revolutionary change invaded our village and before long it was buzzing with activity rather much like a disturbed hive. The monument to tsar Alexander II that dominated the centre of the village was pulled down. Religious instruction was abolished in the local school. Those of the villagers who were away serving in the Army and the Navy returned to their homes and organised a local committee of the village poor. The



peasants were busy sharing out landlord estates and distributing the farm equipment, animals and other possessions left behind by the fleeing landlords.

Soon afterwards our village was made the administrative centre of the volost, and officials of the young Soviet power became frequent visitors at the village.

I retain vivid memories of the first post-revolutionary meeting held in the village square. The main speaker, a representative of the uyezd Party committee, described the international situation, explained to the villagers the meaning of Lenin's Decree on Land and the tasks facing the local committee of poor peasants. For us village kids that was the day when we first heard the words "world revolution", the "Entente", "the imperialists" and other long words the meaning of which was lost on us. Ivan Livanov, chairman of the volost executive committee, spoke next and in conclusion invited the villagers to ask questions. It was some time before the first question was put to him. A detailed and friendly explanation followed after which a dam seemed to burst. The platform was showered with questions about all sorts of things. Some asked whether it was true that the Germans had gone to war against us again. Others demanded better organisation of the sale of kerosene, matches, salt and other essentials. Some of the questioners were in a hostile mood and made no bones about it — these were the rich peasants, the kulaks.

The poor villagers led the struggle for a new life for all and acted vigorously to counter the sabotage of the kulaks and other enemies of the new order, who tried to hamper the work of the food requisitioning teams and refused to give their surplus grain to the state. My friends and I did our best to help the committee of poor peasants. For instance, we kept watch on the hill overlooking the village and whenever we noticed carts loaded with grain trying to slip out unnoticed we reported to the men at the armed check points.

School hours in those days were rather erratic and there were days when we were dismissed after the first or second lesson. On such days the boys went back to their favourite pastimes. One particular favourite with us was fooling around on the first winter ice on the river that was so clear and thin you could actually see through it. It kept rising and falling under your feet. Few of the boys escaped a ducking in the ice-cold water. Whenever that happened the other boys fished the poor devil out and the whole noisy gang of us would fly headlong to granddad Vancha, the

school night watchman. We could always count on his help in drying the wet things.

Dalneye-Konstantinovo village was about 40 miles away from ours. It was evening when Pavel and I reached Makrashi where we decided to stay for the night. There I saw the first electric bulb in my life. I stood gazing at it spell-bound, unable to tear my eyes away from the bright warm light that emanated from the wonder bulb. In my own village we used to do our homework by the light of a primitive paraffin lamp. I felt as if I were transported to a fairy-tale world. That was my very first acquaintance with the practical implementation of the Leninist programme for electrification of Russia, which later came to be known as the GOELRO Plan. It reached our low-sitting wooden huts covered with thatch and straw and lost in the wilds of the forests.

The next day we reached Dalneye-Konstantinovo, a big village with sturdy well-built houses, some of them made of brick and with two storeys.

### **Forward into the Dawn**

The wooden school-house was set on a hillock overlooking the village and surrounded by a growth of stately poplars. It was once given a coat of pale-blue paint but with time the paint peeled off and now the school-house looked rather drab. The spacious classrooms opened on to the assembly hall which the schoolchildren used as their stamping ground during the breaks. This was where all the meetings and get-togethers were held.

I took an immediate liking to the school. It was a noisy and cheerful place. The classes were given in two shifts. It was a large school with 360 pupils, most of them from the neighbouring villages. Some, like Pavel and myself, were from more distant places. The children's ages varied widely and it was a common enough sight in those days to see fully-grown boys, complete with moustache, sitting at the same desk with small fry. Some of the older boys had been through the civil war and still wore their bleached tunics. But the thing we all had in common, the "big ones" and the "little ones", was our thirst for knowledge. I don't think there was a single case in those days of someone playing truant, although many of the children had to get up at 3 or 4 in the morning, early enough to do their household chores and not be late for school 4 or 6 miles away.

To begin with, we had no textbooks and had to take very full notes on such paper as we could find, which in most cases was wrapping paper.

I remember one of my classmates, Vasya Zanozin, because he was the only one in our class with a normal notebook and he used it as one would use something very precious. He would write his composition or dictation exercise in pencil to rub it off with an eraser later and make fresh notes or write a new composition.

I had a lot of catching up to do. Maths and Russian were the most difficult subjects for me. It took me hours to solve problems in geometry and algebra. In order to learn to write well without spelling mistakes I used to copy out pages and pages from books that were part of my home reading.

When the school broke up for winter holidays I returned to my home village with a light heart and a clear conscience. I did not have a single bad mark. Mother was very proud of my success and also praised my older brother. She often urged us to live in friendship and help each other. Throughout our subsequent lives we never forgot Mother's good advice.

Of course, my life at Dalneye-Konstantinovo was not all school and swotting up for the lessons. In my second year there I was elected head of the school cooperative. Oddly enough, the cooperative was affiliated to the local mutual aid society, which played an important part in our lives. We used the funds from membership fees to buy footwear and clothing for those of our classmates who came from the poorest families, apart from buying textbooks and stationery.



Vasily Fyodorovich K o v a n o v, the  
author's father



Anna Dmitriyevna Kovanova,  
the author's mother

One of the duties of my office was purchasing school supplies and stationery in Nizhni Novgorod.

I made a shopping trip to the city two or three times a year. In late autumn and early spring the journey was a particularly difficult affair, the roads becoming water-logged and practically impassable. I remember one return journey I made in late autumn particularly vividly. It was dark when I arrived at the Surovatikha junction, pouring with rain and the road was all but washed away. I did not want to spend the night at the railway station and decided to walk the rest of the journey.

There was no one to keep me company so I had to walk it alone. Normally in good weather I would think nothing of walking nine miles. But a journey on a dark night in heavy rain, along a messy, water-logged road is a very different proposition. All the more so, if you have to carry a heavy burden. To make things worse, I strayed off the road and had to wander around in pitch darkness knee-deep in mud searching for the road. I have no idea how long I floundered in the muddy fields. All I remember is that at the end of it I was utterly exhausted and I sat down on the ground by some bushes. Suddenly I heard a distant cart creaking along. I jumped to my feet and made for the road as fast as I could. The driver took me to the village.

The next morning I was in such bad shape that I had to stay away from school. After the lessons some of my classmates came to see me. Everyone tried to cheer me up, and I felt a bit awkward having all this attention. At the same time, I must confess, I felt pleased to have fulfilled my friends' assignment.

Soon afterwards, the secretary of the school Komsomol branch, Victor Yavorsky, told me that it was time for me to join the Komsomol, I was the right sort of chap, he said. I was glad to hear that and after talking it over with my brother applied for mem-

bership. In those days anyone wishing to join the Komsomol was considered at a general meeting of the local branch. My case was no exception. At first everything went without a hitch, my classmates told the meeting what a good chap I was, praising me in particular for the good work I was doing for the school cooperative. Then someone rather unexpectedly asked me if I was a believer. I was taken aback and blurted out, "I don't know really. I suppose I am. I've been to church quite a few times." My "confession" was met with an embarrassed silence. I turned my hopeful eyes to my brother, and, sure enough, he came to my rescue. He got up and said that my "faith" was the result of my grandfather's "influence", who was a devout man, and in whose family I had been brought up. He promised the meeting he would reform me. So it was decided to accept me as the brother of an honest-to-God atheist.

Once a full-fledged member of our local Komsomol branch and influenced by my fellow Komsomols I began taking an increasing interest in political problems about which I had previously not had the slightest notion. Those were stormy and unforgettable times. The young people were fired with revolutionary enthusiasm. With an impatience and fervour characteristic of the young, we were champing at the bit, eager to give our energies to the most important thing that had to be done at once.

Lenin's speech at the 3rd Congress of the Komsomol provided a programme of action for all the Komsomols of the 1920s. I remember how avidly we read the little booklet containing the text of that speech. Lenin urged us to learn communism and live the communist way. To appreciate fully the galvanising impact of Lenin's appeal, one has to picture the situation in Russia at the time. It was not so easy in a poverty-stricken, prejudice-bound country struggling with the aftermath of a devastating civil war, amid wholesale economic dislocation, famine, and enemy's fierce resistance, to see the road to a radiant communist future. It took a man of genius like Lenin to point the way for others. Addressing himself to the younger generation, Lenin spoke of building communism as a realistic and practical task to be tackled by the young people. To give of one's best, to do one's utmost in the countrywide collective effort to build the new society, to show initiative and prove one's worth in any job — those Lenin's words were to provide guidance for many of my generation throughout their lives.

On January 22, 1924, the tragic news about Lenin's death reached us. Early next morning the Communists and Komsomols

got together for a brief meeting and then left for the neighbouring villages to tell the population about the bereavement that had befallen the country.

I remember that day in January when we held a funeral meeting in our school. We were all grief-stricken, and many cried unashamedly. We swore an oath to defend Lenin's cause to the end of our days and fulfil the behests of the great leader. Several days afterwards, our teachers read out in class the appeal of the Extraordinary Plenary Session of the Communist Party's Central Committee: "Lenin's physical death is not the death of his cause. Lenin lives on in the heart of each member of the Communist Party. Each Party member is a particle of Lenin. The whole of our communist family represents a collective embodiment of Lenin."

It was during those sombre days that we the Komsomols of the 1920s first saw ourselves as the junior brothers-in-arms in the communist family. It is true that a tragic experience turns a  
th into a man.

### **My First Teachers**

To this day I have the fondest recollections of my first teachers.

In my school days our teachers, like the rest of us, lived from hand to mouth. Some of them lived in the hostel attached to the school, others rented part of a room large enough to put a bed in. Their salary was a pittance and their ration meagre. But the privations did not detract from their devotion to the task of bringing enlightenment to the younger generation of the Soviet Republic.

Ivan Andreyevich Beketov, our physics teacher, and Nikolai Mikhailovich Pavlovich, the history teacher, stood out among their colleagues both because they still wore their uniforms from the days of the civil war and because of their democratic spirit and comradely attitude to their pupils. They clearly realised their mission of building a new proletarian school on totally new principles.

Beketov lived in a small room in the school, where the senior pupils often gathered in the evenings. There was only an iron bed, a table, a book-stand and two or three stools in his room. We were drawn to this kind-hearted and wise man, though we were too young to realise that things were more difficult for him than for most of the other teachers. Beketov was a war invalid.

Apart from teaching us physics, he also helped us get a correct understanding of the events that were unfolding in the country at that time and sought to inculcate in his pupils a fine public-spirited attitude. He often told us that one had to live a useful life.

Our headmaster Sergei Alexandrovich Yakovlev was a tall, smartly turned out man. In his top boots that shone immaculately and his well-pressed service jacket he even was something of a dandy. Yakovlev was an excellent teacher with a passionate love for Russian literature. He recited poems by Lermontov and Pushkin to us or excerpts from Gogol's *Dead Souls* with a good deal of emotion and expression. I don't think I had ever heard a better recital since, not even among professionals. He taught us to love Russian literature. In fact some of us subsequently made literature a life-long profession.

Unlike Beketov, Sergei Alexandrovich did not treat his pupils as equals but rather tried to emphasise his authority. But he never suppressed any positive initiative from his pupils and supported anything they came forward with that he considered reasonable and useful. He attended the school drama society's rehearsals, helped us with the repertoire and edited the school wall newspaper.

I came to know Sergei Alexandrovich well when I was chairman of the pupil's committee. He often sat in on the sessions, always choosing an inconspicuous place and following our heated debate without making any comments. He only intervened when we found it difficult to come to a decision, and with a couple of concluding remarks clinched the argument to everybody's satisfaction.

Maria Vasilyevna Zagryadskaya, a biology and chemistry teacher, was well loved by us all. We always looked forward to her lessons. But perhaps her most interesting sessions were those she held out of doors in the school garden or in the fields or forest. They taught us to read the wise book of nature.

We all wanted to imitate our teachers and do things their way. However, most of us at the time were still undecided as to the choice of a future profession. Our school was designed to train teachers for primary schools and cultural organisers for village clubs and reading-rooms.

In those days we only had vague ideas about professions like engineer, chemist or agronomist. By then I had forgotten all about surgery. Pavel had confessed to me one day that he had invented the prediction of the veterinary surgeon, who saved Orlik, the colt.

But we clearly understood that being a good pupil was not enough. We were expected to fight illiteracy and ignorance in the countryside and to contribute to the effort to transform life along

new socialist lines. To do that one had to equip oneself with extensive knowledge and acquire various useful skills. The book was becoming an increasingly important part of our daily lives. We had a fairly good library at school containing books by Lazhechnikov and Zagoskin, Jules Verne, Dumas, and Mayne Reid. Later these were supplemented by more serious literature. I often visited the volost library where I read books by Chernyshevsky, Belinsky and other prominent Russian literary critics and authors, notably Chekhov and Gorky. I enjoyed reading London's *Martin Eden* and *Spartacus* by Giovagnoli. We used every spare minute to read. Often I read by the light of an oil-lamp well into the small hours.

The works of Lenin provided the answers to the most urgent problems of the day: the New Economic Policy, the cooperative plan, the proletarian state, etc. Our teachers also helped us to take our bearings in the complex political situation.

In 1926 we reached the graduating class. We were avid newspaper readers and often held discussions of the big industrialisation drive. We took great pride in our wall newspaper. Incidentally some of the parents read it as well as the pupils and teachers. Among other things the wall newspaper carried verses and stories by "budding" poets and writers from among our pupils. Literary pursuits attracted many, and so we decided to initiate a literary review of our own. Our head schoolmaster favoured the idea and gave us every support. Sasha Frolov, my classmate, was unanimously elected editor-in-chief. The very first issues made our review very popular with the pupils.

Unfortunately this project was short-lived. As I said, the decision to start the literary review was sanctioned by our headmaster. The news of it reached Victor Popov who was volost Komsomol committee secretary. We all loved and respected our secretary who often attended our branch meetings and helped us with advice and in more practical ways. But, as ill luck would have it, about that time Victor was transferred to another job and he was succeeded by a certain Boris Moiseyev. The new secretary struck us as a conceited and bossy type. He looked down his nose at us and whenever someone approached him with a problem he never advised but admonished. We took an immediate dislike to Moiseyev. When he learned about our literary review, Moiseyev immediately summoned Victor Yavorsky, who was our branch secretary, and ordered to stop publication forthwith as he considered it a form of factionist activity.

Our school was the mainstay of the volost Komsomol



organisation. The conflict that flared up between Boris Moiseyev and our Komsomol branch was fraught with serious complications. Frolov took a firm stand and defied the order issued by Moiseyev. The latter got Frolov summarily expelled from the Komsomol for his recalcitrance. The other members of the editorial board were given public reprimand.

The senior formers together with the teachers protested at the unjustified punishment. When the news of this sorry affair reached the uyezd Komsomol committee, the overzealous volost Komsomol branch secretary was severely reprimanded while Sasha Frolov was reinstated. Our literary review never reappeared, however.

This failure upset us very much. But we did not lose heart and were still looking for a chance to show our initiative. Beketov, Yakovlev and Zagryadskaya encouraged us in every way. One other adult friend we had was Yelena Alexeyevna, the mother of Vasya Ruzanov, one of my classmates. Her husband had been murdered by local kulaks. Yelena Alexeyevna, being a courageous woman, overcame her grief and joined the Communist Party. At the time I am describing she was working at the volost women's committee.

She often visited our school bringing us a basket of home-made pancakes and told us about the events in the volost. The Bolsheviks, she told us, had decided to bring culture and literacy to the people. The most important job was to combat illiteracy, conduct anti-religious propaganda and propagate new ideas. One handicap in this effort was the shortage of cultural organisers and teachers. Yelena Alexeyevna advised us to expand our "enlightenment" activities.

We went on lecture tours of the neighbouring villages where we gave talks on the "problems of the moment" and conducted anti-religious propaganda. The response was varied. The old women as a rule heaped abuse on us, calling us ungodly brats, while the young people gave us a ready hearing, particularly when the talks were accompanied by slide shows and physical and chemical experiments, primitive though they were.

Soon afterwards we were summoned for a talk with the secretary of the volost Party committee. After praising us for our initiative and desire to contribute to the common effort he told us that our task, as he saw it, was to rally the young people in the villages around us, to form a body of activists and organise recreational facilities and cultural activities.

Unfortunately, we did not have time to put the Party secretary's recommendation into practice because spring came and with it our school leaving exams.

Upon leaving school some of our pupils, including myself, were offered a job in the primary school. I had to turn down the offer because the desire to become a doctor had been rekindled in me. It was prompted by a tragic turn of events at home.

My Mother was getting worse and worse. Father rustled up some money and took her to Moscow to be examined by good specialists. Their return home coincided with my last school holiday. Father was overcome with grief. Mother, as always, was staunch. She herself told me about the Moscow doctor's verdict: her case was hopeless, no medicine would save her. I could feel she was broken inside. Oh, how I hated that Moscow doctor! To this day I believe that his cruel frankness shortened my mother's life. On many occasions during my professional career I met medical men who mistakenly considered it their duty to tell their patients the bitter truth. I agree that in some cases the patient must be told the truth about his disease in order to make him fight it more resolutely. But this can only be done when the physician is satisfied that the disease can be cured given the patient's active participation. Those physicians who inform their patients about the hopelessness of their case commit an unpardonable mistake.

I left home at the end of my winter holidays depressed and fearing that I would never see my mother alive again. She must have noticed my state of mind and did everything she could to reassure me. As I was leaving, my mother stood on the steps waving good bye until I passed out of sight.

A few days after my return to school the sad news reached me. My mother had died.

Soon after my mother's death Father gave up farming and moved to Moscow. To start with, he took a street sweeper's job and later found a job in a bakery. He was anxious that I complete my studies and join him in Moscow.

My school-days over, a new life awaited me, bringing new problems and making me lay new plans. Vasya Ruzanov and myself decided to go to Moscow. The rest of my classmates went to different places. Unfortunately, not all of them succeeded in continuing their studies.

Incidentally, my friendship with Frolov has survived to this day. I was present at the defence of his doctorate in chemistry and I was glad of his success.

In 1969 the school at Dalneye-Konstantinovo celebrated its centenary. The celebrations were attended by many former pupils who had come from many different parts of the country to pay tribute to those who gave them a start in life.

## II. THOSE UNFORGETTABLE STUDENT DAYS

*The children are our tomorrow's judges, critics of our views and actions, they are people who are going out into the world to undertake the great work of building new forms of life.*

*Maxim Gorky*

### At Moscow University

In 1927 I came to Moscow firmly resolved to enter the University's medical school. But once here, people in the know advised me to apply to two or three higher educational establishments at once, saying that if I failed the entrance examinations at one college I may be more lucky with another and in this way would not be left high and dry.

I listened to their advice, made copies of my school-leaving certificate and other documents and took them to three colleges at once, the University's medical school, the Timiryazev Agricultural Academy's Department of Agronomy, and the Biological Department of the Second University. No wonder the examinations became a veritable nightmare. On some days I had to take two or three subjects one after another. Within a week I had become a reeling wreck, though normally I was sturdy enough. Well, there was nothing for it, I had to go through with it.

Then disaster fell.

At the mathematics examination to the medical school I had to solve three problems. I did them easily enough and was on the point of going to the examiner's desk, when the girl who was sitting behind implored me in a tearful whisper to help her. Pretending to

pass me a rubber, she slipped me a sheet of paper with the problem. But when I tried returning the answer in the same manner, the paper dropped to the floor. The examiner noticed the goings-on and ordered me to leave the auditorium. The girl tried to speak up for me, telling him it was all her fault, but he would not listen. I was deeply disappointed. I did not blame the girl though, but my own clumsiness.

So I said goodbye to my dream of the medical school and went on with the exams at the other two colleges. But there was a disappointment in store for me at the Biological Department as well. The problem in physics proved too much for me, and the examiner failed me. The Timiryazev Academy, the only one left, did not appeal to me in the least.

No, I decided, medicine is what I want, and I'll do everything in my power to become a doctor.

At this point fortune smiled on me, I received a postcard from the medical school selection commission and hurried to the University hopefully.

The secretary of the selection commission rebuked me for my irresponsible behaviour and gave me permission to take the mathematics examination once again. I sailed, as though on wings, into the auditorium and handed the secretary's note to the very same examiner who had ordered me out several days before. The man looked me over in outraged surprise and then began grilling me. But I managed to answer all his questions, and was accepted. My dream had come true.

Of the 450 people who were enrolled at the Moscow University medical school that year more than half were graduates of Workers' Faculties and assistant doctors. Both categories were accepted without exams. The Soviet Republic was sorely in need of a new intelligentsia that would be of the people and with the people all the way. Back in 1918 V.I. Lenin had signed a decree on the new rules of admission to higher educational establishments. The decree abolished all tuition fees and instituted grants and hostel accommodation for students. And, most important, it stated that preference in enrolment would be given to young people of working-class origin. Factory Party organisations recommended young people who worked in industry and had served in the ranks of the Red Army for study at higher educational establishments.

The Workers' Faculties, which were organised in the early years of Soviet power, played a tremendous role in making higher education accessible to young people from the working class and the peasantry and served, as the People's Commissar for Education

Anatoly Lunacharsky put it, as “firemen’s ladders” along which working-class youth could climb into the windows of colleges, could attain higher education. Graduates of Workers’ Faculties changed the face of higher education, bringing the new proletarian ideology, class consciousness and perseverance into the student body.

It was not difficult to recognise the demobbed medical assistants among the rest of the students, for they continued to wear their army uniforms and had an unmistakably military bearing. Many were men with considerable experience and work records. They had come to Moscow with their families to study at the University, and were given family accommodation at the student hostel. There were quite a few men in their thirties among the graduates of Workers’ Faculties, men who did not get a chance to study until after the Revolution. Only a small part of the students had come straight from school. Most of these were workers’ and poor peasants’ children, like myself.

The medical school was considered to be the University’s second most difficult department after the Physics and Mathematics Department. The touch-stone for all would-be doctors was the autopsy room. Those who found themselves incapable of mastering fear and nausea had no choice but to leave the medical school. To give the University Rector, Professor Udaltsov his due, he was quite understanding and did not obstruct medical students who asked to be transferred to another department. Later, when I was rector of the First Medical Institute in Moscow, I often regretted that the rectorate was no longer allowed to be so lenient in these matters: isn’t it better to give a man a chance to correct his mistaken choice before it is too late, than chain him to a profession he does not like? This applies to any speciality, but medicine more than most.

In their first and second years, medical students are given a theoretical grounding. They study the structure of the human body, the functions of organs and tissues and the biochemical processes within the organism. The principal subject at that stage is anatomy.

The Chair in Anatomy was held by Professor P.I. Karuzin, a prominent scholar and teacher. He was a tall man with a handsome face and a high prominent forehead. He spoke softly and clearly in an unhurried manner. The one thing that caused us difficulty at first was the many Latin words he used in his lectures. Later we discovered that he had worked for many years on a reference book of Latin terms used in medicine, and this accounted for his predelection for Latin. However, the most important part of

anatomy was not the lectures but our lab work. This was conducted by Professor Karuzin's assistants, who were also our examiners. I remember how we all quaked before assistant professor S. O. Stopnitsky. He never gave you a passing mark until he made sure you knew by heart, for instance, every nodule, depression or furrow on the skull.

Aunt Dasha, our cleaning-lady at the hostel, kept discovering human bones in the most unlikely places. Each time she made a sign of the cross in horror and swore she would refuse to tidy up our rooms until we took all the bones back to the cemetery where they belonged.

After we had learned all we could about the theory of bones and tendons, we were taken on our first visit to the autopsy room where cadavers were laid out on marble slabs for us. The assistant, seeing our dismay, began explaining that there was no reason to be afraid of a corpse since it had been disinfected in a formalin solution and presented no danger. This method of conservation prevented the corpse from putrefying, and it merely turned gray with the passage of time.

These practical details did very little to put us at ease. Infection was the last thing we worried about. Our feelings were much more complicated. It is difficult to describe the sensation which sweeps over you when you first see a human being's isolated organs and tissues. Those who have experienced it will know what I mean. Someone will inevitably feel sick and dash out. Still, most students get used to this strange atmosphere.

The thing that gave us most trouble was Latin. We had to learn all the anatomical terms in Latin. In ancient times the Romans developed a medical terminology, and the Greeks, who were the first capable doctors, gave names to various diseases. All attempts to evolve national medical terminologies have failed. A medical student, whether he likes it or not, has to memorise hundreds of Latin and Greek words during his first two years.

We all loved the anatomy lectures given by assistant professor M.F. Ivanitsky. He presented his seemingly dry material in so lively a language and did such vivid drawings on the blackboard in coloured crayons that after his lecture we were not only richer in knowledge but also exalted, as though we had been listening to good music or poetry.

Another assistant professor, E.O. Grelich, was quite colourful. A man of advanced years, lean, with a sparse goatee, he addressed male students as *signors* and our girls as *signorinas*. If a student floundered helplessly at an examination, Grelich would grumble: "Off with his head." For all his stern manner, he enjoyed our warm

affection as well as our sincere respect, for we set great store by his frankness, integrity and teaching skill.

First-year students flocked to physics lectures delivered by Professor A.B. Mladziyevsky. Even professors and students from other departments came to listen. A chubby, ruddy man, he dashed about from one apparatus to another working magic tricks which captured our imagination.

Professor Bogoyavlensky, who held the Chair in Zoology, came from a very different cast. His delivery was exceedingly monotonous and dull, and he did not pay the least attention to his audience. We could amuse ourselves in any way we liked, while he, corpulent and immobile, droned on about the structure of some beetle, butterfly or spider, his deep-set eyes fixed on some point above our heads. While most lecturers held examinations in the mornings, Professor Bogoyavlensky began no earlier than ten or eleven at night. His expression while the student spoke remained impassive, giving no indication whether he approved or not. He would sit deep in his armchair, head lowered, seemingly unaware, but in actual fact very much awake.

Professor M. N. Shaternikov, a pupil of the famous physiologist I. M. Sechenov, gave us extremely helpful advice about the intricacies of our future profession. I can still see him, a tall lean old man with straight features and a head of wavy white hair. His manner was simple, his delivery unsophisticated, but his practical examples were so striking and instructive that we remembered them for the rest of our lives, and they subsequently helped us avoid many mistakes.

Our teachers impressed on us the importance of the doctor's manner, as well as his skill. The prominent therapist Konchalovsky told us: "If the patient feels no better after the doctor's visit, he is a worthless doctor." Y. F. Dombrovskaya, an experienced pediatrician, said that a doctor who touches a child must have warm hands. Cold hands may frighten and antagonise the little patient, while a children's doctor must first of all earn his little patient's confidence. "Warm hands,"—we remembered that phrase which had more than the obvious meaning.

What attracted us particularly about Professor Shaternikov's lectures on physiology was that he appealed to our minds and urged us to think with him and work out a solution together. Many of us were only too eager to stay at the physiology lab after lectures, helping in experiments on animals to establish the function of different organs and systems. In this way we obtained practical knowledge which came in very handy in our later work.

At last the second year with its stupefying cramming of Latin terms and chemical formulae was over. The doors of the clinics opened before us.

At the end of the 19th century, a complex of clinics was built for the University's medical school at Devichye Polye. The main clinics stood in two rows divided by a straight avenue lined with lindens. It is referred to as the "Avenue of Life". At the beginning of the alley stands the obstetrics clinic. Here one enters the world. A bit to the side, across the road is the children's diseases clinic. To the right are various theoretical chairs and the Chair of Hygiene and opposite, along Bolshaya Pirogovskaya Street stand the buildings of the surgical and therapy clinics. They were built according to the same design. All are two-storeyed structures, with large light wards, long, broad corridors and big windows. The therapy and surgical clinics for the fourth-year students are housed under the same roof, and similarly, in another block, are the hospital clinics for the fifth-year students. Between the two buildings stands the central polyclinic. At the end of the alley is the morgue. Here one's life's journey ends, or rather, here ends one coil of the endless spiral of life.

The first clinic we came to was the surgical one. Its auditorium was, in point of fact, a large operating room. The walls were faced with white tiles, the ceiling was painted white, and along the walls were rows of chairs for us students. In the middle stood an operating table. A little to the side a nurse, wearing a sterilised smock and a gauze mask, stood at a table with instruments. She had everything ready at hand: the instruments, the dressings, the drugs.

A young woman with a tightly bandaged chest was brought in. She was put on the operating table. Her swollen reddened breast was bared. The assistant began the preparations, swabbing the area with alcohol and then smearing it with iodine. The anaesthetist took his position at the patient's head.

The professor gave us a brief outline of the case history. The patient had been breast-feeding a baby. A crack had appeared on her nipple, followed by a slight swelling and redness in the lower part of the breast. She had applied compresses, but they had not helped. Because of severe pain she had to feed the baby from one breast only. Gradually the pains had grown worse and she developed a high fever. The diagnosis was mastitis, inflammation of the mammary gland. The only treatment was an operation.

We watched the professor's every movement. He wore a sterilised smock tied with a belt and rubber gloves. His face was covered with



a gauze mask, with only his eyes, attentive and calm, visible. He looked different from his usual self, alert and collected. The anaesthetist put a mask on the patient's face, and she lost consciousness. Short resolute movements of the scalpel opened up the abscess. The professor cleaned the wound and plugged it with dry swabs. The operation was over.

We found it hard to believe that an operation could be performed so quickly, in a matter of seconds. The patient was taken away, while we sat there dazed. It would be no exaggeration to say that the atmosphere overawed us. For the first time in our lives we were present at the sacred ritual played out by doctors and nurses in an operating theatre. Everything was ideally clean and orderly. Nobody made so much as a superfluous gesture or uttered a word out of place. Each of us was thinking the same thing: will I ever be able to do that?

After that first operation we all decided to become surgeons. Trying to control trembling in our legs, we would stand for hours at the operating table, holding the hooks the surgeon used to distend the wound and watching the course of the operation.

Once the sight of a gaping wound and gushing blood made me go weak at the knees and I slumped under the operating table in a dead faint. The senior nurse caught me with alacrity born of practice and brought me round with the help of smelling salts. I felt terribly ashamed before my comrades and especially the professor whom we all held in the highest esteem and even idolised, as young people will. However, when the operation was over, the professor gave me a friendly pat on the shoulder saying, "Never mind, it happens to the best of us."

There and then he told us about the famous surgeon Sklifosovsky fainting just like me when he was in his third year at the medical school.

Our professor's name was Pyotr Alexandrovich Herzen. I shall say more about this remarkable man in Chapter III (see p.51)

### **Medicine Relies on Drugs**

Our greatest headache in the third year was pharmacology. This subject was the bane of all students, demanding as it did cramming into our heads the action of all the various drugs, and besides that dozens of prescriptions and the dosages to be prescribed in different cases. Still, pharmacology gave us a sense of power over the functions of the human body. We learnt about drugs which depress or excite the nervous system, kill pain, stimulate heart action, lower or raise blood pressure, etc.

They only began using drugs to kill pain during operations in the middle of the last century. The father of Russian pharmacology Academician N.P. Kravkov was the first to suggest intravenous anaesthesia. At the beginning of this century a drug to be used for local anaesthesia was developed. These major discoveries determined the subsequent development of many fields of medicine. Before they were introduced patients suffered terrible agony during operations and often died of shock.

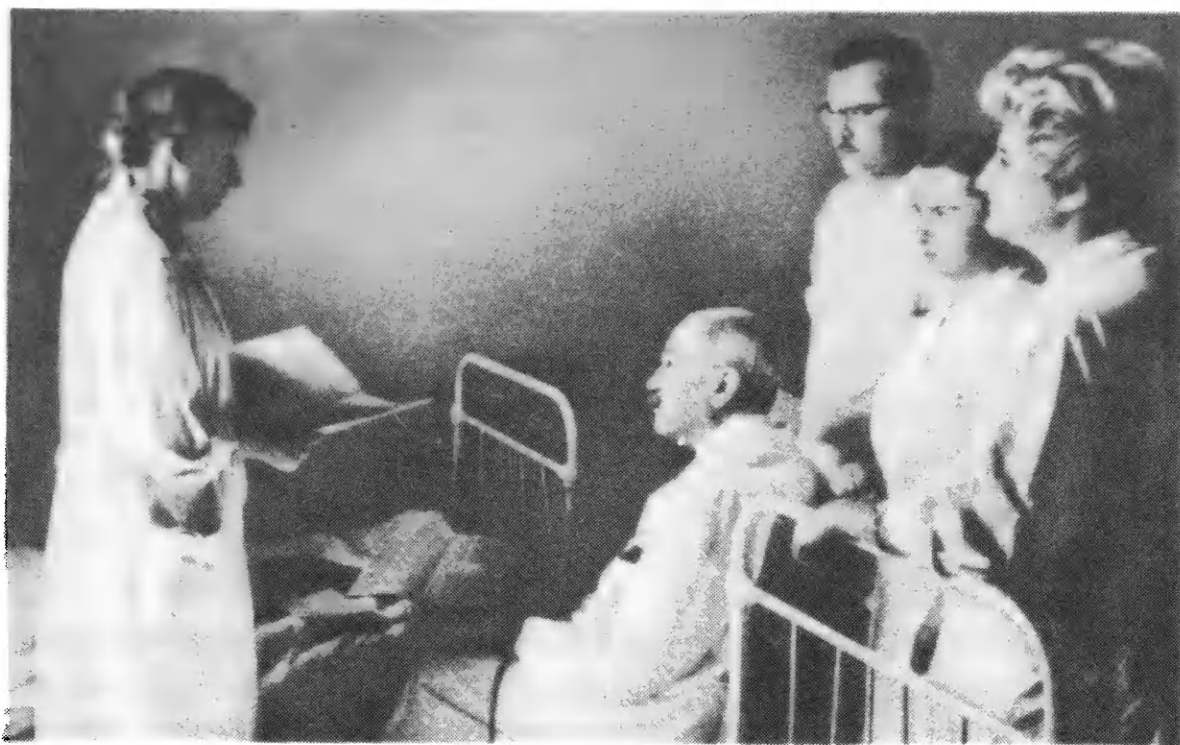
Nowadays, narcotics and anaesthetics are used to produce unconsciousness during operations. A separate science, anaesthesiology, has emerged. It studies problems connected with the regulation of the body's functions during and after an operation, the main role, again, belonging to drugs.

The drugs which are particularly interesting are the ones which make up for a deficiency of natural substances required by the body, for example hormones. These are the so-called endocrine preparations. Many diseases are caused by a deficiency of vitamins. Thus scurvy develops in the absence of vitamin C, a vitamin B<sub>12</sub> deficiency results in malignant anaemia, and a shortage of vitamin B<sub>1</sub> causes polyneurites, etc. Today effective treatments have been developed against these diseases.

Pharmacology has many fascinating aspects. Those of us who had an inclination for theoretical research could delve into the drugs' mechanism. Those of a more practical bent were interested in the development and testing of medicinal substances.

The most amazing thing about pharmacology is its speedy development. Scores of new drugs appear every year, and sometimes whole new groups of them with an entirely new mechanism burst on us. And doctors are supposed to keep abreast of all these developments. The difficulty we had as students in memorising the action of various drugs was nothing in comparison with the practising doctor's dilemma of choosing the most effective drug out of the vast and ever-growing arsenal.

A milestone in pharmacology was reached with the development of psychotropic preparations, drugs that affect man's mental condition and help to regulate emotions. The first steps in this direction were made by Academician Pavlov. But really effective psychotropic preparations were not developed until the fifties, when, within a short time a galaxy of emotion-controlling drugs appeared, which included tranquillisers (such as aminazine and tryphthazine), "fear-allaying" drugs (andaxin, elenium), anti-depressants (imipramin, etc.), psychotonics (stimulating the nervous system), etc.



Professor V. N. Vinogradov on his rounds

It would be no exaggeration to say that the development of psychotropic drugs wrought a revolution in psychiatry. The new drugs became an effective weapon in combating psychoses, depression and other mental disorders.

Today all these drugs are in wide use. This is only natural, seeing that the tempo of life and work in the second half of the twentieth century has greatly increased the loads the human psyche has to cope with. Still, I must sound a warning here: excessive use of psychotropic drugs may disturb the organism's normal reactions, with the consequent harm outweighing the good.

Within the last two or three decades strides have been made in the development of endocrine preparations. This refers, first of all, to insulin, a drug which is used to make up for its natural shortage in patients suffering from diabetes mellitus.

Until recently, insulin used to be isolated from pancreas of animals. Now they have succeeded in synthesising it. This is a major achievement in pharmacology, seeing that insulin is a very complex protein substance consisting of 51 amino acids. Before long synthetic insulin will be available to diabetes patients.

Analogues of natural hormones or their synthetic substitutes are used in the treatment of thyroidal disturbances, rheumatic lesions,

skin diseases, for stimulating childbirth, and in many other instances. These preparations have a high physiological activity and their manifold action and possible side-effects should be taken into account when they are used.

Many demands are made on pharmacology by the "diseases of the age", the hypertensive vascular disease, angina pectoris and myocardial infarction. Heightened arterial pressure is connected with changes in the tone of the blood vessels. The majority of hypotensive drugs (lowering the blood pressure) act on nervous regulation, lowering the activity of that part of the nervous system which is responsible for the tone of the blood vessels. The widely known reserpine belongs to this category. It is isolated from the plant *Rauwolfia serpentina* growing in the foothills of the Himalayas (reserpine has now been synthesised, but the process is very costly and it is cheaper to obtain the drug from the plant). Other effective hypotensive preparations of the same action, octadine, pirilen and others, have been developed. Substances are also used which affect the salt metabolism (hypotiaside) or directly affect the muscles of the blood vessels (papaverine, dibasol).

Diseases of the heart vessels, which disrupt the supply of blood to the heart muscle, are a very grave disorder. Mostly they involve spasms in the vessels or grave blood-clot condition, which often happens against the background of atherosclerosis. In lighter cases the disease manifests itself in short but very intense pains in the region of the heart, while in severe cases there occurs necrosis of part of the heart muscle—myocardial infarction. To prevent and treat such disorders preparations have been developed which dilate the vessels affected by the spasm (nitroglycerine, corontin, chloracisin), prevent the formation of blood clots (heparin, phenilin) and dissolve thrombi which have already formed (streptokinase).

Pharmacology has made great progress in cardiovascular preparations, yet practical medicine is still not satisfied. Chemists and pharmacologists must develop more effective medicines.

Millions of human lives have been saved since the advent of antimicrobial preparations which help combat infectious diseases. The first to make their appearance were the sulfanilamides (white streptocid and its analogues). However, pharmacology, as I have already stated, is a science distinguished with its rapid advance. In 1941 penicillin started its triumphant march across the globe. Millions owe their life and health to it. Within a few years many

more antibiotics were evolved with a broader spectrum of action — tetracycline, levomycetin and many others. Active anti-tuberculosis substances (streptomycin, phthivazid, paraaminosalicylic acid) and anti-fungal preparations were developed.

The present generation of doctors find it only natural that active preparations should be available against almost every ailment. The fact that they did not exist yesterday is past history. My generation is much more aware of the vast strides made by pharmacology within the last thirty or forty years, but one problem still awaits solution—cancer. The feasibility of drug therapy in malignant tumours has been proved in principle. There is every reason to hope that active preparations against this terrible disease will appear in the not too distant future.

In other words, pharmacological research opens up wide vistas to young people who decide to devote themselves to medical science whose ultimate aim is to rid mankind of disease.

### **Man's Invisible Enemies**

In our third year we studied malignant tumours and purulent infections and were able to see with our own eyes the havoc man's invisible enemies wrought in his organs and tissues. At practical studies in pathological anatomy we examined cancerous cells and other malignant neoplasms under a microscope.

Curiously, at first cancerous cells look very much like young tissue. Then follows their explosive proliferation which entails the destruction of healthy cells, the development of metastases and the spreading of the tumour over the organs. This is the distinguishing feature of a malignant growth.

Man's invisible enemies, pathogenic microorganisms, which we, future doctors, were to fight, were extremely numerous and variegated. There is a great number of progenic pathogens, and each behaves differently in the organism. One microbe causes the development of an abscess or a phlegmon, another, erysipelatous inflammation, a third, gas gangrene. At microbiology classes we learned what these microbes looked like and how they differed from one another.

Our course of microbiology embraced morphology and physiology of microbes, the concept of immunity, characteristics of pathogens and methods of prevention and treatment of diseases caused by them. As in other subjects, a lot of time was allotted to practical studies. We were shown how to take samples for

laboratory investigation, make slide preparations and stain them, were acquainted with methods of isolating and cultivating microbes, and learned to distinguish bacteria under the microscope. It was all extremely interesting.

Bacteria, we discovered, had various shapes, spherical, rod-like, spiral, or comma-shaped. It appeared that the rod-like bacilli were the most numerous of all. The most widespread microbe which lives in man's large intestine is *Bacillus Coli*. There are some two or three billion of them in each gramme of human faeces. There are some pathogenic microbes which resemble *Bacillus Coli* in appearance, for instance the pathogens of dysentery, typhoid fever and paratyphoid fever. The pathogens of tetanus and gas gangrene also have a rod-like shape.

Gradually we learnt to distinguish them all, came to know their "temper" and vulnerable spots.

A preparation would often contain, besides rods and spirals, the spherical cocci. Sometimes they are gathered in clusters, much like grapes, and are then called staphylococci. They are found in the pus from a wound. Very often they trigger off an inflammatory process at the site of tissue lesion.

Chain-forming bacteria, which are like beads on a thread, are called streptococci. They cause erysipelatous inflammation in one case, tonsillitis in another and endocarditis, inflammation of the heart's lining membrane, in a third.

If the cocci occur in groups of two they are called diplococci. These cause meningitis, gonorrhea, and pneumonia. This does not mean, of course, that one and the same species of diplococci causes such very different diseases as meningitis and gonorrhea.

It is not at all easy to find one's bearings among these multifarious pathogenic organisms. And it is even more difficult to decide whether the microbe discovered (staphylococcus or streptococcus) will trigger off a disease.

In certain conditions, when the organism has been weakened and its resistance lowered, pathogenic organisms, entering through a lesion in the skin, may cause a severe illness. In other cases, when the organism is strong and has good immunity, the same microorganism may remain in a dormant state and not visibly affect the organism.

Some bacteria also exist in the form of spores—round or oval, which may be located either in the nucleus of the cell or on its periphery. The tetanus bacteria keeps its spore at the edge of the cell, while in anthrax, the spore is placed in the centre of the cell. The transformation of a bacillus into a spore is a special stage in

the development of a microbe that enables it to survive in an adverse environment. The spore “dons” a coating which is refractory to both high and low temperatures and can withstand the action of various chemical substances (antiseptics). The spores remain alive after boiling and even after being frozen to the temperature of liquid nitrogen. For this reason, pathogenic microbes capable of forming spores (tetanus, gas gangrene, etc.) are particularly dangerous to man. Their spores can get into a wound with earth, germinate and cause a grave disease.

At microbiology classes we were not only acquainted with pathogenic microorganisms, but also with methods of fighting infections caused by microbes, of raising the resistance of the organism and inducing immunity by means of preventive inoculations.

Our microbiological studies impressed upon our minds the need to strictly observe all the prescribed methods of disinfecting the operation theatre, the surgeons' hands, instruments, bandages, linen and everything else involved in a surgical operation. To be frank, my comrades and I had thought these precautions excessive. Why should a doctor scrub his hands with a brush for half an hour, when washing them would do?

We attentively observed the routine work in the operating theatre and dressing room, learning not only from the surgeons but also from the nurses and other assistant personnel. We would watch an operation, standing immobile and silent for hours. Towards its end we would be as tired as the surgeons themselves, but we left with a feeling of elation, conscious of having added to our knowledge.

In general surgery we learnt that before the modern aseptic methods of boiling and steam disinfection were developed, they fought purulent infection with the help of antiseptic solutions (carbolic acid, mercuric chloride, rivanol, etc.). The introduction of antiseptics in the middle of the last century was undoubtedly a great achievement. At that time a great proportion of the wounded died of suppurative complications which followed surgical intervention. For example, an operation on a small benign tumour in the soft tissues of the head was often followed by blood poisoning and death on the second or third day. The famous Russian surgeon Nikolai Pirogov was horrified at the number of fatalities subsequent on minor operations. Of course, in these conditions, antiseptic methods played a very positive role.

At the same time, very soon the negative aspects of this method came to light. In the first place, the antiseptic solutions not only kill

bacteria but also destroy tissues in the wound. In the second place, antiseptic used for disinfecting the air in the operating theatre and the wound often caused severe poisoning. "We poisoned ourselves and poisoned our patients," Professor V. F. Snegirev was to recall later, "believing that in this way we were killing infection in the patient's organism and in the surrounding atmosphere. May we be forgiven this craze! We lost our teeth and the patient lost his life."

Modern aseptic methods have done a lot to prevent bacteria infection in operations. Furthermore, microbiologists have developed non-surgical means of fighting purulent infection with the help of antibiotics, anti-toxic sera, bacteriophages, etc.

Antibiotics proved to be extremely effective against microbes. But with time it was discovered that microbes are able to adapt and survive in a medium which, it would seem, precluded their continued existence. Antibiotics-resistant strains were evolved. Moreover, some microbes began to produce the enzyme penicillase, in the presence of which penicillin promoted the development of pathogenic bacteria. Therefore, purulent infection remains, to this day, one of the most baffling problems in surgery. Besides "arming" themselves against antibiotics with enzymes, the microbes "put on" coatings that cannot be penetrated by antibiotics. The problem arose of discovering substances capable of destroying the enzymes and breaking down the microbes' cell-walls. In the sixties such substances were found. They are proteolytic enzymes which not only destroy pyogenic microbes but also clean the wound of necrotised tissue. Subsequently a method was developed of using them in medicine.

At our microbiology lectures we learnt about a large group of diseases whose pathogens had not been discovered until very recently. These pathogens are so infinitesimal that they pass through porcelain filters. They are the so-called filtrable viruses. They were not visually observed until many years later, when the electronic microscope was invented.

In comparison with the viruses, the microbes I mentioned earlier are veritable giants. The proportion between their sizes is approximately the same as between a five-storey house and a brick, or an elephant and a mouse (as described by the prominent Soviet virologist V. M. Zhdanov). But the harm these tiny creatures do to the human body is out of all proportion to their size. They cause influenza, smallpox, encephalitis, rabies, poliomyelitis, measles, etc. Today more than 2,000 viruses have been discovered and



described. A special department of microbiology has appeared—virology, and virological research institutes and laboratories have been set up.

We, third-year students, were tremendously impressed by the work of senior students, members of a microbiology research group. These people had already made their choice in medicine and were working diligently in their chosen field, microbiology. There were only ten or twelve of them, but they were all great enthusiasts. They amazed us by the skill with which they manipulated their tiny instruments. Here is one example. They were entrusted with a mixture of dangerous microbes like the typhoid bacillus, the dysentery bacillus and *Bacillus Coli*. The students had to isolate pure cultures from this mixture, not by the method described in their textbooks but by the more complex capillarisation method. Before our eyes, the microbiology group members lowered strips of sterile paper into the test-tube containing the microbes—this paper only absorbed typhoid bacilli, and then warmed the tube to 45 degrees, which killed the dysentery microbes (*Bacillus Coli*, we found out, survives such heating). This was all done with such assurance and dexterity that we forgot these were students like us, only two or three years our senior. We gazed at them with admiration and respect usually reserved for real researchers.

The budding microbiologists were naturally aware of the impression their “trifling experiments”, as they disparagingly referred to them, made on us. In the end, they invited us to their lab and demonstrated some absolutely fantastic things. More than four decades have passed since, but I still remember vividly an experiment staged by a group of microbiology enthusiasts from the Chair headed by Professor I. M. Velikanov. They had to infect lice with rickettsia by means of an enema (yes, enema!). Armed with a magnifying glass, they managed to give enemas to some 150-200 lice within an hour. This was something in the style of Lefty, the proverbial Russian wonder-blacksmith from Tula who shod a mechanical flea.

Some of those microbiology enthusiasts, such as M.P. Chumakov, A.K. Shubladze, M.N. Sokolov and O.P. Peterson, to name but a few, later became leading specialists in antibiotics, rickettsiology and virology, at home with the most complex experimental methods.

This is yet another proof of how important it is for a future scientist to take part in a students' research group, which gives him a chance to take his first, and vital, step in science.

## School of Civic Awareness

During my student years we, Moscow students, gave all of our free time to public duties. This had become a vital need for us.

Students of the seventies will probably have difficulty in picturing the atmosphere of those tempestuous twenties. Its distinguishing feature was the young people's preoccupation with politics.

I remember my first year at the University.

At Komsomol meetings we debated whether socialism could be built in one country, whether it was sensible to turn all efforts to the priority development of heavy industry and how the alliance of the working class and the peasantry was to be understood.

Trotskyites and their mouthpieces among the students held that the victory of socialism in our country was impossible unless the proletarian revolution also won in the West. They attacked the principle of democratic centralism and demanded freedom for factional struggle within the Party. Maintaining that the peasantry was a reactionary force that was against socialism, they worked for a split between the workers and the labouring peasantry. The Trotskyites made a bid for the young people's sympathies, declaring them to be the Party's "barometer". They stopped at nothing to win the student youth over and dislodge it from Leninist positions.

We usually held our Komsomol meetings in the Communist Auditorium, one of the largest at the University. On a number of occasions we were addressed by Alexander Kosarev, Secretary of the Moscow Komsomol City Committee. He spoke with a slight lisp, making up for this defect by his fiery temperament and marking the most important points with a vigorous chopping movement of his arm.

I well remember one speech of his.

"The situation today," he said, "is characterised by a sharpening of the class struggle in our country. The capitalist elements, feeling they are being ousted from their last entrenchments, are putting up a stubborn resistance. They are well aware that the future belongs to those who gain the support of the youth, and so they are looking for (and sometimes find) loop-holes through which they can slip to enmesh young people in their web of influence. Our class enemy is trying to play up the difficulties of socialist construction to confuse and win over the young people."

The speeches of Moscow's youth leader invariably brought forth a lively response. Occasionally Trotskyite yes-men would cause a

disturbance, shouting their slogans and stamping their feet. But they were promptly subdued by their own fellow-students, and, if they persisted in their disruptive activities, would be bodily ejected.

Some of the students came under the influence of Right-wing capitulators, who were opposed to the high rate of socialist industrialisation and collectivisation in agriculture.

In those turbulent days, when passions ran high at meetings, Alexander Kosarev's fervent speeches helped us to find our bearings. He urged us to resist the fallacious reasoning of the capitulators, to reject the arguments of philistines appealing to all that was base in man, and to stand firm by the general line of the Party.

We medical students were wholly in support of the Central Committee's line and helped fight the opposition not only in our own ranks but also in Moscow's factories.

My brother Alexei guided me along too. In 1927 Trotsky came in person to the Aviapribor factory where he worked. Trotsky was seeking support among highly skilled workers but met with ignominious failure.

In October 1927, *Pravda* published the proceedings of the Fifteenth Party Congress. The Central Committee announced a general Party debate. We read the reports about the debates avidly. More than 99 per cent voted for the Central Committee's line. Trotsky's and Zinoviev's followers found themselves in isolation. The voices of their devotees among the students grew weaker.

Our Komsomol Bureau was compelled to take stern measures against the most stubborn deviationists: they were expelled. Those who admitted they had been wrong and left the opposition were reinstated a few months later.

On several occasions President Mikhail Kalinin addressed the students in the Communist Auditorium. He would discuss the most vital issues. He spoke with the amazing clarity, invincible conviction and compelling simplicity of a man whose views had been shaped by many years of revolutionary struggle. His manner was not at all spectacular, but striking and remarkably individual. It was a conversation rather than a speech. He would criticise us, then give us the friendly advice of an experienced propagandist and express a warm, truly fatherly concern for our well-being.

When working with the masses, Kalinin enjoined us, we should never flaunt our education. We must speak to them simply, frankly and straightforwardly, as if we were speaking to people who could reason as well as we and could arrive at an equally correct solution.

In his speech dedicated to the Komsomol's tenth anniversary Kalinin stressed that a man of the new era, a builder of socialist society, must combine harmoniously a striving for professional knowledge with civic awareness.

"You may ask," he said, "what is more important for a doctor: to be good in his profession or to be less qualified but very active in public affairs? I would answer that a doctor's prestige is proportional to his professional reputation. The better specialist he is, the greater his authority in public affairs."

Kalinin's advice was very timely, for quite a few of our medical students had gone to the extreme of becoming engrossed in Komsomol work to the detriment of their studies: they neglected their lectures and practical work and regarded examinations as something outdated and unnecessary.

Kalinin put things in their right perspective.

Medical students took an active part in *subbotniks* (voluntary work on Saturdays), where we unloaded grain and vegetables from trains. There was a lack of manpower at that time and the Party and Komsomol organisations often appealed to students for help.

Nobody was exempt from physical work. Once two fourth-year students said they would not unload trains because they might injure their hands and their hands were very important for them as future surgeons. They were subjected to such ridicule that they hastened to join the volunteer stevedores.

Sometimes on top of unloading, we had to clear snow from the railway tracks. And so work would continue late into the night.

Once in early spring there was a heavy snowfall, and the city transport was brought to a standstill. The normal functioning of Moscow's industrial enterprises was in jeopardy. Urgent measures had to be taken. During the night the district Party Committee sent out an alert and dispatched the students to clear the tracks around the railway stations.

We took part in the *subbotniks* with great enthusiasm. Many had not heard Lenin's words: "We shall work for years and decades prompting *subbotniks*, developing them, spreading, improving and instilling them into people's mentality. We shall thus arrive at the victory of communist labour." But each felt that we were furthering the greatest and dearest cause—the cause of Russia's socialist transformation.

A vigorous campaign had at that time been launched to put an end to illiteracy. The Party considered teaching everybody to read and write a task of primary importance affecting our entire cultural

advance. Thousands of illiterate people, from adolescents to old men and women, had sat down at desks to pick up pens in their awkward fingers.

Few of our students could be found at the hostel after classes. After a hasty lunch we went to different factories where we taught the illiterate to read and write. The work took a lot of time and required great effort and perseverance.

Students today may think these occupations trivial. But it was in this manner that many social traditions were formed.

Then the time came when each of us was given an opportunity to test himself in a really big and responsible undertaking.

In 1929 the Party scored its first major victories in the socialist transformation of agriculture. Together with Party members, Komsomol students were sent to the countryside to persuade the peasants to join collective farms.

A group of medical students was sent to the outlying districts of Moscow Region. They conducted propaganda work and, at the same time, gave medical aid to the population. This combination opened the hearts of the local people. If the medical student happened, moreover, to come from peasant stock and to know about life in the countryside he was assured complete success in his task.

In the country many of us found ourselves in a very complex situation. On the one hand, some districts had been completely collectivised, testimony to a historic change of heart among the peasant masses. On the other hand, the kulaks did their best to disrupt collectivisation, murdering, burning collective-farm property and spreading rabid, if underhand, anti-kolkhoz propaganda. I had a chance to see with my own eyes what class struggle in the countryside involved. My own brother Pavel, who was chairman of a collective farm in Kaluga Region was shot at by the kulaks and his house was attacked.

Several decades later I happened to visit those parts again. The swampy wooded country where kulaks set up ambushes for collectivisation activists is now Obninsk, a major scientific centre. Physicists are delving into the mysteries of the atom there, seeking new methods to protect man's life and health.

### **The "Communards"**

The one thing that was never lacking during our student days was novelty. The higher school was being reformed, and one

change after another, quite a few of them uncalled for, were introduced into the curriculum and instruction.

For a while we studied according to the "team method" in which the student's knowledge was judged by the progress made by the group as a whole. It was sufficient for a student to be present in class to receive a satisfactory mark for the theme studied at that lesson. Examination marks were given on the basis of the professor's talk with the group. Fortunately, this "progressive" method did not last long. Individual examinations were reintroduced in all major subjects.

During the stormy years of the First Five-Year Plan the country became one large construction site. We were beset, naturally enough, by various shortages, especially consumer goods and food. But we did not mind, knowing that to build a firm socialist economy within the shortest possible time, required the utmost straining of the country's resources. And when the workers came out with the slogan "Let's complete the Five-Year Plan in four years", we decided that we students had no right to absent ourselves from the countrywide effort. After heated debates we came to a unanimous decision: to complete our five-year programme in four years. The new People's Commissar for Health M. F. Vladimirsky supported the students' initiative. True, we only managed to cut down our course by half a year, but even that was a big success, seeing that the curriculum was a very strained one as it was.

In 1929 the Moscow University's medical school was reorganised into the First Medical Institute. Two large hostels, one in Malaya Pirogovskaya Street and another in Zubovskaya Square, were put at our disposal.

There were three or four of us to a room. At first, there was no canteen at the institute. The students who lived at the hostel decided to pool their resources and organise their own kitchen and canteen serviced by themselves. We took turns buying the food, cleaning the place and cooking our plain meals.

In this we formed yet another student organisation which knit us closer together. But the Komsomol leadership thought it not enough. In those years a Komsomol member was considered duty bound to be a leader in work and everyday life. We took great pride in doing just that.

At the automobile works being constructed in Nizhni Novgorod (now Gorky) Komsomols set up commune-teams which undertook the most difficult tasks and set an example of a conscientious attitude to work. The idea of living and working as one big family,

like those working youths did, appealed to us strongly. In this desire we were encouraged by the example set by the Plekhanov Economics Institute and the Timiryazev Agricultural Academy, where student communes had already been set up.

So a meeting was held where the idea was proposed. It appealed to many. But when the question of which type of commune was raised, the Plekhanov or the Timiryazev one, heated arguments ensued.

The Timiryazev students had pooled all their "material resources". All income went into the pool, beginning with the students' grants. Books, clothes, shoes and underwear had all been made common property. At the Plekhanov Institute, on the other hand, they restricted themselves to collecting a fee of 21 rubles from each "Communard". His remaining money, if any, was left to him to dispose of as he saw fit, and so were his textbooks and other possessions.

The hot-headed among us were for the Timiryazev type, whereas the Plekhanov version was supported mainly by the older students. In the end a charter was worked out and adopted. On the anniversary of the Paris Commune, the "Pirogovka Commune" officially came into being.

Our charter ruled that all money was to be submitted to the Commune's coffers, while books and textbooks were to go into a common library. A given part of the common fund was assigned for food, books, clothes, footwear, linen. Sometimes there would be a heated debate as to who was to be given priority in buying a coat or a pair of shoes. If a "Communard" had a family to support, an allowance was paid to him from the common fund. The remaining money was spent on amusements: we went to cinema and theatres. or would all go to the nearby skating-rink. The fare money was kept in a tin in the community room, and each took what he needed.

The entry procedure for new members was as follows: the would-be "Communard" would submit an application to the Commune's Council. The application would be posted up in a conspicuous place. The Council asked all who knew the student whether they had any objection to his joining the Commune on the grounds of bad temper, nasty habits, unwelcome attitudes and the like. Then the candidature was discussed in great detail at the general meeting of the Commune in the presence of the applicant. It was not easy to pass this "trial".

Our Commune included students reading medicine, history, chemistry, mathematics and law. In the evening there would be

very interesting discussions, which sometimes became heated disputes about science, politics, culture and art. As a result, medical students would begin attending lectures in Soviet Law, while students from other departments came to hear our lectures on psychiatry or forensic medicine. This benefited all concerned.

We had a very strict schedule: we rose at seven a.m. and did exercises. Breakfast was at eight. After lectures we had lunch at the canteen and at eight in the evening we had supper in the community room, prepared by our members on duty. Between lunch and supper our time was free.

Every day two "Communards" were on duty, usually a boy and a girl. They received groceries from the shop on special vouchers (the choice was not very wide) and prepared three meals for the 26 members to the best of their ability. For such inexperienced cooks it was a far from easy task, especially as their duties included fetching the food, keeping the fire in the stove going and washing the dishes and pans. Towards the end of the day, the couple on duty would be literally dropping from exhaustion and barely managed to drag themselves to their beds.

All 26 "Communards" were good students and read a lot. They never missed a chance to attend a lecture by Lunacharsky, Yaroslavsky, Semashko and other prominent Soviet cultural figures. Besides, each was politically active, some being members of the Komsomol Bureau, while others were on trade union committees or academic commissions. During the summer holidays we worked in Young Pioneer camps, went on expeditions or did practical work in district hospitals.

We were all eager to join in some serious undertaking as soon as possible. Many senior students went to the Volga region during our winter and summer vacations to help the doctors there fight trachoma. Others joined expeditions from the Malaria Institute to districts infested with the disease. Still others went with special groups assigned to combat some infectious disease.

Two medical students, Mikhail Chumakov and Ivan Pavlyuchenko, went to the Far East as members of an expedition headed by the prominent scientist Professor L.A. Zilber. After this trip Chumakov decided to specialise in virology and later achieved singular success in this field.

### **Michurin's Assignment**

I was fortunate enough to meet Ivan Vladimirovich Michurin and even to do my bit to help him with his selection work.



At that time the great selectionist was constantly in the public eye. His amazing achievements in evolving new varieties of fruit trees, the boldness of his scientific experiments and, particularly, their striking results made a tremendous impression on everybody. Michurin had the stature of a magician who had penetrated nature's innermost secrets and had the power to make it serve his will. His famous maxim, "We cannot wait till nature grants us a favour, our task is to take it from her", was in accord with the revolutionary spirit of socialist construction.

Agriculture's social, economic and scientific foundations, were being remade. A man working in a collective economy, freed from exploitation and armed with machines, was transformed from a slave of the land to its master. With his experiments Michurin was demonstrating what man could achieve, once he had mastered nature's laws.

Being a peasant's son, who had spent his childhood and youth on a poor farm in Central Russia where rye, oats, flax and potatoes were grown at a terrific labour cost, I found Michurin's experiments breath-taking.

In the summer of 1934 I was called to Comrade Zolotukhin, Head of the Young Pioneer Department of the Komsomol Central Committee, who came to the point straightaway:

"For several years you have worked in Young Pioneer camps; now you have qualified as a doctor, and we know you take an interest in botany. Well, I have a proposition to make: we want you to take a group of Young Pioneers on expedition to the Altai mountains. It's in response to Michurin's request to the Komsomol Central Committee that young people help him to collect wild berries and fruit."

I was dumbfounded. It is one thing to take an interest in botany and quite another to have a good working knowledge of it. Wouldn't I be out of my depth?

"Don't worry, a specialist will go with you, a botanist from the University, Professor Nagibina." Now *that* was a very different kettle of fish; I agreed at once. "Now for the preparations. You and Grisha Krasnoshchekov, a correspondent for *Kolkhoz Children* are to go to Kozlov\* at once. You will meet Ivan Vladimirovich and he will tell you where to go and what to look for."

We found Michurin in his orchard. Wearing a long linen blouse and a straw hat and accompanied by a little dog, he was walking down an alley leaning on his stick. Grisha introduced me as a medical graduate who also took an interest in botany and had

\* Now Michurinsk. — Ed.

taken part in several expeditions. Michurin shook my hand warmly and we sat down on a bench. From the conversation that followed I found out that Michurin was not only interested in fruit-bearing plants, but also in medicinal ones. He said he was seriously tackling the problem of evolving a plant that could be useful in the treatment of malaria.

Later Ivan Vladimirovich took us on an inspection of his wonder-orchard, telling us lovingly about every plant and tree in it. He showed us grape-vines which were resistant to the severe winters of Tambov Region and bore fruit that was a match, in size and taste, for the best varieties of grapes grown in the Crimea. He showed us the clinging bush actinidia and regretted that its berries were not ripe yet—they had the taste of pineapple (that was why he named the variety pineapple actinidia). We also learned about the wonderful medicinal properties of *Schizandra chinensis*, a plant which is native to the Far East but could easily be grown in European Russia.

As we listened to Michurin's explanations about his own varieties of apples, pears and currants and the wild plants he was interested in, the purpose of the Altai expedition gradually emerged.

"It would be wonderful if you found the frost-resistant onion. I was told there is a variety of onion up in the mountains, *sagano*, which can stand frosts up to 50 or 60 degrees C below zero without losing its germinating capacity. If I could only get hold of it," Michurin said dreamily.

"We'll go over the mountains with a fine comb, and find it for you," I promised.

Our expedition collected 21 species of frost-resistant berries and over 150 decorative trees, shrubs and grasses. And we did bring a lot of *sagano* bulbs.

Michurin wrote us a heartfelt letter of thanks.

Today, several decades later, as I look back on that expedition, I think it was not only a very useful botanical undertaking, but also a fine schooling in life for its young members. Given good organisation and strict discipline, such trips can be an outlet to adolescent energy and thirst for adventure and teach youngsters to overcome difficulties and shoulder responsibility.

In recent years the Komsomol has launched another excellent undertaking for adolescents—expeditions over the battle grounds of the civil war and World War II, to bring to light and commemorate their fathers' and grandfathers' feats of valour. These trips leave an indelible impression on young minds and

foster the feeling of patriotism and veneration for those who gave their lives for the freedom and happiness of future generations.

This vast land of ours, spreading from the Arctic to the subtropics, has hardly been studied at all completely. There is great scope for youthful geographers, botanists, geologists, historians, students of folklore, etc., and these pursuits help to instil in young people a love for their country and a consciousness of their responsibility towards it.

### III. RUSSIA'S GREAT DOCTORS

*I burn as I light the way  
for others.*

*Nicolas van Tulp, a famous  
Dutch physician*

It so happened that during my student years I met many interesting people, outstanding Russian doctors. In this chapter I shall talk about some of them.

#### **Grandson of the Great Revolutionary Democrat**

That outstanding fighter against autocracy, and distinguished writer and thinker Alexander Herzen wrote in the foreword to his book *From the Other Shore* dedicated to his son Alexander: "We are not building—we are only pulling old structures down, smashing the barriers. We are not making new revelations—we are only destroying old fallacies. The modern man is a sad *pontifex maximus*, he only makes pontoon bridges. The Great Stranger ... of the future will cross over that bridge.... Perhaps you will see him ... and then you will follow him.... For it is better to perish with Revolution than find refuge in the almshouse of Reaction."\*

Alexander Alexandrovich, Herzen's son, a prominent physiologist who lived in emigration all his life, failed to follow his father's behest and "cross the bridge" to disseminate revolutionary ideas in his mother country. But Herzen's grandson Pyotr did

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\* A. I. Herzen, *Works*, Vol. VI, 1955, p. 314 (in Russian).



Professor P. A. Herzen

return home and took an active part in building a new life in Russia.

The path trodden by Pyotr Alexandrovich Herzen abounded in pits and sharp corners. He was born in Florence in 1871. He spent his youth in Switzerland where he received his medical training. From his Italian mother, he inherited a fine aquiline nose, black eyebrows and a soft glow in his big brown eyes.

In compliance with his grandfather's behest, he came to Russia in 1897. Soon he gained a medical degree and started working

as a surgeon in the Staro-Yekaterinskaya hospital "for workmen". While working there he defended his thesis and became a lecturer and then a professor.

Pyotr Herzen's scope of scientific interests was very broad. His plastic operation on the esophagus received world recognition. He performed it on a patient who suffered from a scar stricture of the esophagus following a sulphuric acid poisoning. Pyotr Herzen modified the method which had been suggested by his teacher Professor Roux and shaped the esophagus from a segment of the small intestine that was passed under the skin over the sternum. The patient lived more than thirty years afterwards.

Pyotr Herzen read a paper about that operation at the Congress of Russian Surgeons in December 1907. The prominent surgeon P. I. Dyakonov who chaired the Congress said: "I don't think any of us would deny that the report we have just heard is really rare and outstanding and that in the person of Doctor Herzen Professor Roux has a remarkable pupil. This case opens a wide vista to us and we no longer need consider such patients hopeless."

The operation to construct an artificial esophagus from the small intestine passed over the sternum has made its way into textbooks under the title Roux-Herzen operation, and is practised to this day.

When we first entered the surgical clinic, Professor P.A. Herzen

was in his heyday. He was a brilliant lecturer and pedagogue. We were enthralled by his temperamental presentation, erudite knowledge, original thoughts and remarkably colourful speech. He spoke with an accent, sometimes misplacing his stresses. To connect his sentences he used the expression "precisely". He used it a lot, and each time it performed a different function, sometimes as an expletive, sometimes as an interjection. We were used to this mannerism and it irritated no one. On the contrary it seemed to add to Professor Herzen's charm.

We loved watching him operate. We were fascinated not only by the speed and precision of his movements, but also by the artistry of his work. It was not only competent, it was beautiful.

I still remember one operation of his. It was an excision of a cancerous mammary gland. The complicated operation proceeded without haste or fuss, remarkably efficiently and, seemingly, easily. In a few minutes, almost bloodlessly, the tumour together with the muscles, was removed. Incidentally, when it fell to me to perform a similar operation on my own, things did not go nearly so smoothly. I thought I did everything exactly as the professor had done, but the result was very different.

There was hardly a situation, it seemed, that would daunt Professor Herzen. Only the word "interesting" that he would drop sometimes indicated that things were not as simple as they might appear. But he rarely used this word in the operating theatre. In time we came to realise that this word really meant "I think I am running into trouble". However, Herzen's favourite pupil Professor Lukomsky assured us that Herzen never pronounced this word until the actual danger was past.

After an operation that we had watched, Professor Herzen would take us into the autopsy room and ask us to reproduce the operation on a cadaver. If a student bungled something, he asked him to repeat it again, and yet again.

Professor Herzen loved to have his students walk him home after classes. He always walked quickly, and we, young people, barely managed to keep up with him. He would question us on the way about how we spent our free time, whether we went to theatres and what we liked to read. He had a great sense of humour and was very witty.

Once a boil formed on his neck. A doctor who had come from the provinces for a course of practical studies asked the eminent professor deferentially:

"What are you treating it with?"

"Large doses of contempt," Herzen answered ironically.

There was a lot of truth in that joke. At that time science did not have any reliable means to control the microorganisms which cause suppurative processes including boils (antibiotics only appeared in the forties).

During one operation, having stopped a haemorrhage with his finger, Professor Herzen remarked: "The best instruments are the fingers." Indeed, Herzen's fingers were truly magical and would move with a jeweller's precision when it was necessary to isolate a tumour, a blood vessel or a nerve trunk, or to cut the tissue to the required depth with one sure movement of the scalpel.

Herzen performed operations on various parts of the human body; he did surgery of the limbs, plastic surgery, surgery of the spleen, restorative operations on nerves, the larynx and the closing of fistulas on the parotid gland. But the crown of his achievement was the elaboration of the "strategy" against cancer.

In his oncological studies Herzen kept stressing the importance of early diagnosis and timely surgical intervention. In this he saw the promise of success in fighting this terrible disease. When he was put in charge of the Oncological Institute, set up on his initiative,\* the spectrum of surgical intervention in cancer increased, with a big drop in post-operative fatalities. The institute became a training centre for oncological surgeons.

Herzen also stressed preventive measures against possible malignant growths without waiting for cancer to become a terrible fact. This trend was given prominence in the institute's work. An analysis of various cancer localisations and methods of fighting it led Herzen to the conclusion that all future measures would be futile if they were not accompanied by a wide sanitary state campaign among the population and rank-and-file physicians.

A few words about Professor Herzen's professional and scientific principles. It was his firm conviction that a surgeon should not only possess technical know-how, should not only have a thorough knowledge of anatomy, but should also be at home in physiology and pathology. He maintained that without a knowledge of these disciplines, it is impossible to correctly diagnose and operate well.

His own knowledge of anatomy and physiology was truly amazing. "A surgeon," he wrote, "has no right to pick up a scalpel without knowing anatomy and envisaging possible physiological complications and their causes." He would read anatomical atlases and physiological reference books as though they were thrilling

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\* Now the Moscow P. A. Herzen Oncological Institute. —*Ed.*

adventure stories. In them he sought answers to the many puzzles and unsolved problems that surgery has always abounded in.

One would think there was nothing particularly new in Herzen's professional attitude. That outstanding physician of ancient Rome, Claudius Galen, upheld the same principles. But surgery in the first half of the twentieth century was very different from Galen's, penetrating, as it did, the whole human body, including the heart. A thorough knowledge of anatomy and physiology was essential for its success.

Herzen's professional and human credo was a protective attitude to the patient who had been forced into the clinic by his ailment. He never tired of reminding us that any operation was a shock to the patient. Even though it may be, in many cases, the only way of saving his life, a surgeon should always strive to minimise the shock and ensure that it did not cause more suffering than the original disease.

Nowadays, these principles, far from losing any of their import, have gained in significance. At one time Hippocrates wrote that a philosopher-surgeon was on a par with God. Pyotr Alexandrovich Herzen deserves to have this aphorism applied to him more than anybody else. Not simply because he wrote philosophical treatises, but because he was a thinking surgeon, who could muster all information known to contemporary science to make a thorough analysis of the case and arrive at the only correct solution.

Herzen had firm faith in the future of surgery. Therefore in the discussion provoked by the publication of the Russian Professor S. P. Fedorov's book *Surgery at the Crossroads* and other books in the same trend abroad in 1926-1927, he took a progressive stand, maintaining that the future of surgery lay not only in its technical improvement but also in its symbiosis with related sciences which would open up great prospects for it. Herzen gave battle to the sceptics doubting the future of surgery and was an active opponent of all dogmatism and formalism.

Professor Herzen considered a true medical scientist to be one who, in solving fundamental problems of medicine, formed a school and trained pupils able to promote science on their own and to achieve more than their teacher had done. He was profoundly moved by a letter his teacher Cezare Roux wrote him in connection with the improvements he had introduced into the operation on the esophagus, where the latter said that "pupils surpassed their teachers".

Herzen urged budding doctors to study their subject deeply, to ponder on its problems. He was fond of young people and had faith

in them. Once, while taking a stroll with Professor Lukomsky, he told him:

"I am happy to be living in such a tempestuous time. I rejoice in the young people who surround me and who sweep me forward."

Professor Herzen enjoyed living. He maintained that life was given to man only once, and should be cherished and prolonged with everything at medicine's disposal. Our social system offers great opportunities for this, for it puts medicine in the service of all working people without differentiation.

Pyotr Alexandrovich Herzen lived a long and vivid life. He was an outstanding surgeon and made an enormous contribution to Russian and world medical science.

### **The Outstanding Therapist**

In those days Moscow doctors used to say jokingly: "If a patient demands to see a professor, Konchalovsky should be invited." Indeed, the head of the therapeutical clinic, Maxim Petrovich Konchalovsky put patients' minds at ease with his very appearance. Tall, well proportioned, with a handsome face and an impressive blond beard, he produced a remarkably soothing effect on a patient.

Konchalovsky was an outstanding therapist. Having made his grade as a physician and scientist before the Revolution, he accepted it unquestioningly and bound his life with that of Soviet Russia.

Konchalovsky was a superb diagnostician. He regarded the human body as one whole. In establishing the causes of a disease he attached great importance to the influence of the environment and was forever stressing the advantages of the Soviet system which made it possible to do away with a number of harmful external factors. He was a great champion of the preventive trend in the Soviet health service.

Teaching, research and hospital work absorbed him completely. He could not bear to be away from his clinic even for a day. If he had to go away on business, to attend a congress or the like, he would hurry back to his clinic the moment he was back, irrespective of the time of day. He was truly indefatigable.

Konchalovsky attached prime importance to lectures in the shaping of future doctors. At lectures the students learned the clinical manner of thinking, assimilated the lecturer's rich experience, received up-to-date information about the etiology, pathogenesis and methods of treating various diseases.



“Every person becomes ill in his own way,” Konchalovsky used to say. One and the same illness may be caused by entirely different factors. He considered lectures supported by numerous demonstrations to be the best means of passing on medical knowledge to the younger generation.

The students knew how painstakingly Konchalovsky prepared every lecture. Before the lecture he was not to be bothered with any practical matters. He would assign interns and even students to take part in his lectures, after a previous “run-through”.

When his assistant informed one or another of us that he was to present a patient's case at the next lecture, “the chosen one” would get in a great state of nerves. He was expected to know all the data pertaining to the case by heart. Before the lecture the professor discussed the form of the report with him, and advised him about his behaviour in the presence of the patient, especially when the illness was grave and there was little hope of recovery.

If research had been done by a worker from the department on the theme discussed in the lecture, Konchalovsky would always mention the results obtained with fatherly pride. He did his best to encourage every one of his assistants, and to present him in the best possible light, unless of course the person proved thoroughly undeserving.

The students also learnt a lot from Konchalovsky during his rounds of the clinic. It was considered a great piece of luck to be included in his retinue. Konchalovsky was very gentle with his patients. He always examined them thoroughly and listened attentively to their complaints, but never once did he permit himself to correct the attending doctor in the presence of his patient or to cancel anything the doctor had prescribed. If he had to do this, it was done out of the patient's hearing.



Professor M. P. Konchalovsky

Konchalovsky was of the opinion that the treatment of each patient should be individual and all-embracing. He made wide use of massage, therapeutic exercises and baths. He attached great importance to the doctor's beneficial psychological influence on a patient.

Like M. N. Shaternikov, he taught us to be sparing of the patient's psyche, to avoid hurting or frightening him with an uncautious word. He demanded that the doctor should know everything about a patient. If a doctor started rummaging in a sheaf of analyses reports during the professor's rounds, he was sternly reprimanded later.

The same applied to students. We were not even allowed to use the approved case history forms but were told to write out more detailed ones, setting down the line of our reasoning in great detail. We would sit by a patient's bedside for hours, collecting data on his illness.

It is not easy for a new student to talk to patients. It takes a lot of time to learn to ask the right questions, and to give the right interpretation to the answers.

Very few people are capable of giving a coherent account of their illness. Usually the patient will complain mostly about pains. He will jump from important matters to something quite extraneous and linger on details which have no reference to the disease. Nor must one interrupt him, for he may take offence and refuse to talk altogether. The collection of information (anamnesis) is an art in its own right and not all doctors are masters of it. The art has to be learnt at the patient's bedside during rounds and at clinical discussions. I still blush to remember one of my own efforts.

Anatoly Fedorov, a student who subsequently became a pathologist, and I were talking to a woman patient (it was our first experience of this kind) who had entered the clinic with inflammation of the gall bladder. The patient answered our questions readily enough. The questions, incidentally, were not our own, but had been taken from a standard case history form. The last question ran as follows: Has autopsy been performed on the patient and what results have been obtained? We did not then know the meaning of the word "autopsy" and asked the patient this question unsuspectingly. She stared at us and asked: "Do you realise what you are asking me?"

"Of course we do," we answered with some hesitation.

"If you do, there is nothing else for us to discuss. You are either ignoramuses or brutes."

Tears sprang to her eyes. We were lost and showed it. The patient relented and explained to us:

“Dear colleagues, I am still alive, consequently, I have not been dissected yet. An autopsy involves cutting up the corpse to establish the cause of death.”

We were devastated. Shamefacedly, we begged her to forgive us and not to tell anybody about our outrageous blunder.

Konchalovsky's favourite field of medicine was the pathology of the abdominal organs. At that time no operations on the heart had ever been performed, and our professor used to say:

“This department of pathology is too dull. All right, I diagnose a certain heart defect. Where do I go from there?”

He made an important contribution to the study of the pathology of the digestive tract, producing a classic description of gastric and duodenal ulcers and emphasising that this disease had a preceding functional stage, “a prelude to ulcers”, which practising physicians completely disregarded. Professor Konchalovsky was the first person in the world to describe ulcers as a general disease of the body rather than a local process. He attributed an important role in the development of gastric and duodenal ulcers to unfavourable living conditions, painful emotions and nervous stress. These propositions fully retain their validity today.

Konchalovsky was among the first clinicians to appreciate the importance of cooperation with other specialists in elaborating scientific problems. For many years he collaborated with I. P. Razenkov, a talented pupil of Academician Pavlov. This contact became particularly deep-going when Konchalovsky was put in charge of the Therapeutical Clinic of the All-Union Institute of Experimental Medicine. Workers at his clinic researched in close association with workers at Razenkov's laboratory.

Konchalovsky was overjoyed to note the closer cooperation between surgeons and internists. He never tired of repeating: “A surgeon must be a good therapist, for an operation is only a stage, an episode in the treatment.”

He vehemently opposed unfounded gastrectomy because he considered this operation to disrupt the physiological balance in the organism. “In gastrectomy,” he wrote, “we are not only up against the loss of the stomach's chemical and secretory function; of still greater importance is the loss of the stomach as a cavity with a definite muscle apparatus.”

Konchalovsky also held very definite views on the treatment of gallstones. He considered surgical intervention to remove the gallstones only permissible if two courses of spa treatment had failed. He liked to cite his following experience to support his contention:

“When I was called in, the patient was in extreme pain. One attack followed another. Whatever I tried, nothing was of any avail. Having exhausted all means of relief I myself offered an operation. She refused. Then I prescribed a treatment and left. That night I was awakened by the woman’s husband. He was distraught. He said his wife was dying and begged me to help her. I gathered my things together and we went to their place. Can you imagine our surprise when we found her sitting at the table drinking tea. She apologised for the trouble she had given me and went on to say: “See, you said I had to undergo an operation, but the stone got out by itself.” And Konchalovsky would show his listeners a stone the size of a hazelnut.

He explained to us that gallstones did not necessarily indicate an operation because ruptures of the bile ducts, unlike appendicitis, were comparatively rare.

I must note that Konchalovsky’s point of view did not prevail for long, and subsequently therapists advise patients suffering from gallstones that they should undergo an operation. On the other hand, his idea that “the stomach shouldn’t be cut out” through thoughtless haste was given scientifically substantiated support at the first symposium held by the All-Union Society of Gastroenterologists in 1967. Participants in the symposium came to the conclusion that conservation therapy should be the main method of treating gastric ulcers, and that surgery should be resorted to only when indications are overwhelming and when the surgeon and the internist jointly conclude it is necessary.

Rheumatism was another “blank spot” in medical knowledge at that time. Little was known about its pathogenesis, nor were any effective methods of fighting it known. These were only developed much later. Konchalovsky succeeded in drawing practising doctors’ and medical scientists’ attention to this great social problem. “The time has come,” he said, “for doctors of all specialities to join efforts in order to tear down the curtain and expose the intimate nature of rheumatism and thus disperse the fog which still blankets this illness.” Konchalovsky was put in charge of the 1927 committee assigned to studying rheumatism and finding methods of controlling it.

I must also mention another important aspect of Konchalovsky’s activities. He made a great contribution to the shaping of the Soviet health service. The organisation of resort treatment was carried out under his direct guidance. He was also a pioneer and enthusiast for introducing blood transfusions.

Incidentally, the Institute of Blood Transfusion was organised by A. A. Bogdanov, a prominent doctor and scholar, who was also its first director. Research conducted at the institute provided material for Bogdanov's conclusion that blood transfusions were beneficial to the human body in various disorders, including extreme overwork. He believed that blood transfusions increased the vital forces of the organism and postponed ageing, which sets in all too early in modern man.

Bogdanov was so taken up with this idea, that he decided to demonstrate its correctness on himself. He underwent 11 exchange blood transfusions, and the twelfth, performed on 24th March, 1928, proved fatal. Excessive introduction of alien proteins with the transfused blood played its grievous role. Bogdanov's death was an example of a scientist's courageous dedication. While a fatal complication was in progress, Bogdanov conducted meticulous observation of himself noting all the signs and symptoms of the disease, only stopping when he lost consciousness. We learned about Bogdanov's last hours from Konchalovsky, who also interested himself in this new and important undertaking.

For many years Konchalovsky was a consultant and chairman of scientific conferences at the Institute of Blood Transfusion, which played a tremendous role during World War II. Together with Maxim Gorky he sponsored the establishment of the Institute of Experimental Medicine in Moscow.

Konchalovsky devoted a lot of his time and energy to reorganising higher medical education. He was of the opinion that medical training under the Soviet system should combine theoretical natural sciences, special clinical subjects and the philosophy of Marxism-Leninism.

It was no accident that he invited A. G. Gukasyan, who had graduated from the Institute of Red Professors, to be his assistant in the department.\* Konchalovsky also proposed a special course for doctors to study Marxist philosophy.

In an article dedicated to the memory of Russia's outstanding medical scientist S. P. Botkin, Konchalovsky wrote: "Let us learn from him how to love science, how to love our country, especially today, when the Great October Socialist Revolution has provided medicine with every opportunity of serving the Soviet people."

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\* A special higher educational establishment which trained lecturers in social disciplines. — *Ed.*

And it was to the service of Soviet medicine and the Soviet people that Maxim Petrovich Konchalovsky gave all his talent and ability.

### **The Birth of a Man**

It was September 1, and we were gathered to hear the first lecture of Professor Malinovsky, who was to introduce us to a new field of medicine, obstetrics and gynaecology.

We had already heard that Mikhail Sergeyevich Malinovsky was a splendid speaker, a person of high culture and with a wide knowledge of clinical and theoretical medicine. His lectures were exceedingly popular with students.

There were no vacant seats in the auditorium. Some students were even sitting on the steps. Professor Malinovsky established contact with his listeners from the very first phrases. Nobody exchanged whispered remarks or otherwise let his attention wander. All listened attentively to the introduction about a new field of medicine, its emergence and development.

Obstetrics is the science about pregnancy and birth, their physiology and pathology, about aid that must be given to a woman in labour. It is one of the oldest branches of medicine. The first mention about obstetric aid is found in the papyri of ancient Egypt and the sacred books of the Hindus. In Russia scientific obstetrics dates from N. M. Ambodik-Maximovich who wrote the book *The Art of Aid in Birth or the Science of Women's Labour* (1784). Still, for centuries before, and even afterwards obstetrics was anything but a science.

Our lecturer painted grim pictures of the past, when the normal procedure was to give birth at home, or even in the field. In some countries a woman in labour was driven outside and made to walk in the yard until she was ready to drop. In others, she was considered unclean and nobody was allowed to touch her.

"Dear colleagues, I have witnessed such things in my own time and I did my best to fight these barbarous customs," our lecturer said. "When I started my independent work as obstetrician in Kazan Gubernia, I often had occasion to go to remote corners of that region and help in grave and complicated cases, when both woman and child were on the brink of death. And too often I was unable to help them.

"You are aware that the Revolution put an end to such practices. Motherhood in our country is acknowledged as the woman's social function and, like childhood, it is given special protection by the

state. Ever since the Soviet state was set up, health protection has been regarded as of primary importance. Even in the most difficult years, when epidemics and famine were rife in our country, maximum care was given to the children, to ensure a strong and healthy younger generation.

“In the decision of the Conference on Women’s Work, called by the Central Committee of the Russian Communist Party (Bolsheviks) on September 14, 1922, it was stated that the task of protecting motherhood and infancy could not be removed from the agenda under any conditions in the proletarian state. Special laws protect the labour and health of women, especially during pregnancy. Maternity homes and children’s institutions are growing in number every year.”

From the social aspects Malinovsky proceeded to the biological ones, suddenly addressing a student sitting in the first row:

“Tell me, how will you distinguish a woman’s pelvis from a man’s?”

The student blushed and mumbled something, obviously straining to remember the textbook on anatomy. We in the back rows could not hear one word of what he was saying.

Professor Malinovsky heard him out patiently and even praised him for not having forgotten the size of a woman’s pelvis—“you’ll need this information in your obstetric practice”.

Malinovsky could present the most difficult things clearly and vividly. He would support his arguments with data from biology, physiology, anatomy, embryology and other disciplines. His lectures were always rich in new material which could not be found in any textbook, and so among his listeners there was always a fair sprinkling of senior students and practising obstetricians.

We were then in our third year, and we had but a vague idea about the consecutive stages in the development of the human embryo, which repeats the stages of life’s development on earth. In the first weeks and months of development in its mother’s womb the egg first evolves into something like fish, with a fissure where gills would have been, then the embryo acquires the features of a reptile and, by seven months, the embryo becomes covered with a down and begins to look like a mammal.

Having introduced us to embryogenesis, the professor proceeded to instil in us an understanding of the obstetrician’s high mission in society.

Wherever a doctor may find himself, in remote villages of Uzbekistan, in the Far North or in a desert, he will be called upon

to assist in a confinement and help a new citizen enter the world. Whatever the doctor's speciality, he must be able to help even in pathological birth. That is why medical students must become thoroughly acquainted with all the niceties of obstetrics.

"Please, do not imagine," Malinovsky went on, "that everything is simple in obstetrics. In your practice you're liable to run into cases which you have never met in clinic. My first confinement, for instance, ended tragically. To this day I blame myself for lack of resolution. It is not an easy thing to confess. Though it happened fifty years ago, I remember the occurrence as though it were yesterday.

"Soon after I received my doctor's diploma I was called to a Gypsy camp to a woman who had been in labour a long time and to no avail. Excessive self-assurance and the desire to demonstrate my skill led me to dispense with the services of an experienced midwife.

"I arrived at the camp in the middle of the night. The woman lay under a cart on a heap of rags. She was barely conscious. Her sallow face was distorted with pain, her dry lips were cracked and her sunken eyes looked to me with anguish and hope. She did not emit one groan, one complaint. I examined her and realised that the infant was dead. I tried to extract it by the arm that protruded, but nothing came of it. Long minutes passed. All my attempts failed. Overcome with despair at my own helplessness, I jumped up and ran away."

Amazed to hear such a confession from a gray-haired professor, we sat, subdued, thinking about the grave responsibility shouldered by an obstetrician.

Professor Malinovsky was a recognised authority on the physiological trend in obstetrics. This trend, based on the achievements of Russian physiology and biochemistry, was formulated in his textbook of surgical obstetrics which we used to prepare for examinations. Incidentally, Malinovsky's textbook has been acknowledged as the best reference-book for students and practising obstetricians not only in Russian but also in world literature on this subject.

Practical classes in obstetrics were conducted by the clinic's assistants. Our group was under one of the best assistants—Yekaterina Ivanovna Gagarinskaya. Looking at this miniature, slim lively woman, you could hardly believe that she was the mother of four grown-up children.

Yekaterina Ivanovna was always surrounded by students—be it at the outpatient clinic, in a ward, at the delivery room, or in the



study room where she taught us the skills of surgical obstetrics.

She was an excellent teacher and a very sensitive doctor. She made her classes so interesting that even those of us who had by that time chosen their future speciality took a great interest in obstetrics.

Yekaterina Ivanovna also advised us in everyday matters. She knew how to win the students' confidence and warn them against taking a badly considered step in life.

I remember an occurrence which caused quite a stir at the hostel. Two students decided to get married. When such a thing happened, the young couple got all possible help from the hostel management and their comrades. They were given a separate room, helped to buy furniture, kitchen utensils and the like. This time, too, our two comrades got married and set up house in a room at our hostel in Pirogovskaya Street. Every thing went well until a child was born. The young father had not reckoned with the complexities of parenthood. The child's crying, nappies, bother and material difficulties were too much for him. He started absenting himself from home and the family found itself on the rocks.

Yekaterina Ivanovna took the troubles of the young couple greatly to heart. Once after classes at the clinic (with both young husband and wife present) she started talking to us about the responsibility of people entering into matrimony, about the parents' duty to the child and society for the health, upbringing and shaping of a new citizen.

The state helps a great deal with bringing up children, providing free medical aid, nurseries and maternity centres. Still, the child's well-being rested primarily with the parents, not only the mother but also the father. A few days later Yekaterina Ivanovna invited the young couple to visit her home. She did not ask them about anything, but, instead, told them her own story. She had lost her husband and was left on her own with four young children. She had not abandoned her studies, though she had to work in order to feed and clothe them all. "Life was extremely hard," she recounted, "and yet I did not let it beat me. My friends helped me, of course. See, there are my children, all four of them. I did not lose one, I brought them all up, I set them on their road, not one went wrong. Do you think it only concerns myself? No, I have done my duty to society, to the future of my country. And you are young and strong, and there are two of you. You ought to be ashamed to quail before the difficulties. They are not so very formidable. Your life is just beginning, and your child is your greatest treasure. You must do everything you can so that he will grow up in a normal

friendly atmosphere. A family is too precious a thing to be broken up in a hurry."

This "lesson" from their teacher, a person they loved and respected, helped the young couple to tide over the difficult period.

Yekaterina Ivanovna did not take us into the maternity ward until we had mastered the techniques on a model. When that day arrived she inspected each of us, making sure that the smock was spotlessly clean, the hands washed and the hair tucked under the cap. Then, in single file, we entered the labour ward.

The ward was bathed in sunlight. The tiled floor, walls and ceiling were dazzling white. All conversation was in whispers. Everybody's attention was centred on a young woman, who clutched at the midwife's hand nervously.

The midwife, Maria Petrovna, a stout middle-aged woman, had been helping future citizens enter this world for more than 30 years. Hundreds of infants had passed through her hands.

In the early stages of labour Maria Petrovna would establish the spot where the fetus' heartbeats were most audible by palpation. She could not do it by ear because she was hard of hearing. Still she could always tell unerringly whether the birth would be difficult or easy. She would impress on the young woman in labour, sternly and kindly, that she must follow her instructions and take a firm grip on herself if she wanted to give birth quickly and without complications.

We, future doctors, found Maria Petrovna's advice and help invaluable. A veritable "professor" at her craft, Maria Petrovna was very observant and could put in an inostentatious word of advice just at the right moment, when the situation became more than a young doctor could handle. All of us medical students making our first steps in obstetrics owed a great deal to this experienced and kind-hearted midwife.

I was lucky enough to have her direct me in several confinements. I thought I had learned everything there was to learn from her and would be able to manage unaided in future. But in actual fact things never worked out as smoothly as in the clinic, with Maria Petrovna at my side.

The birth is an endlessly repeated miracle which never loses its novelty. The baby announces its arrival with a loud cry. The mother's weary face lights up with joy. All those present smile happily.

The labour ward becomes a scene of cheerful bustle. The pink infant is washed, weighed, and a tag with his mother's name is tied to his hand. Then he is taken to the infants' ward, where there are

perhaps two dozen others, lying in tiny cots swaddled in nappies.

Doctor Smirnov, who was in charge of the infants' ward, assured us, as he took us round his domain, that infants developed individual attitudes from the very first hours. And he was very much displeased to see doubt written all over our faces.

We mastered the art of obstetrics at the clinic and at other maternity homes, where we were sent in groups of three or four. We would take textbooks along and while the time away between confinements preparing for exams. And just when sleep would begin to overpower you, summons would come from the labour ward.

Normally the confinement goes according to nature's plan, but sometimes a complication sets in and then the safe outcome largely depends on the resourcefulness and skill of the doctor and the midwife, and on their determination to fight for the mother and child's life.

Mother and child protection in the Soviet Union is effected through the state-sponsored system of gynaecological and obstetrical establishments providing specialised aid to all pregnant women, confinements and newly-born infants.

Before the Revolution there were few gynaecological centres and maternity homes. In 1913 the entire Russian Empire had only 7500 maternity beds (today the Soviet Union has 224 thousand). More than 96 per cent of all women gave birth without qualified help. At the beginning of the century no less than 30 thousand women died every year in pathological birth, and of every 1,000 of newly-born infants, 270 died within their first year.

In 1969, 98.5 per cent of all births were attended by qualified medical personnel, and 93.4 per cent occurred in maternity homes. Child mortality in 1971 had decreased to 23 per 1,000.

Soviet doctors have made a large contribution to the study of painless birth and regulation of parturient activity. The Soviet medical scientist A.Y. Lurye is regarded as a pioneer of painless birth. Pregnant women's psychoprophylactic preparation for birth elaborated in the Soviet Union has been adopted in many countries.

In recent years, new science-based methods have come to the aid of obstetricians in their study of parturient activity and correction of grave cases. Electrophysiological, biochemical, histochemical, biophysical and genetics methods are now widely used in obstetrics and gynaecology. Some research institutes and specialised departments have been applying cybernetics, radiometrics and mathematics in diagnosing and treatment.

Contacts between obstetricians and research establishments and specialists in related theoretical and clinical disciplines are expanding. This enhances the scientific and practical value of research conducted by practising obstetricians.

All this gives us grounds to expect a further considerable decrease in infant mortality in the next decade. Scientific efforts will avert death for thousands of babies. Can anything be more encouraging than this prospect?

### *My First Acquaintance with Burdenko*

I am sure that even now, after so many years, none of my fellow-students has forgotten the awed trepidation with which we entered the operating theatre when our teacher, the remarkable Soviet surgeon Nikolai Nilovich Burdenko, was there. This man played a great role in my life, and I shall speak about it in greater detail further on. Now I will merely share my first impressions of him, the impact he made on me when I was still a student.

In the autumn of 1930, starting our fourth year, we went to the first of the course of lectures Burdenko was to give. We had already heard from senior students that in his lectures Burdenko examined the diseases that might require a surgical intervention in great detail. One disease, say gastric ulcers, might take up the whole of a lecture, or even two, depending on the number of patients Burdenko had available for demonstration. In this course of lectures, however, the aim was not to demonstrate as many surgical patients as possible, but rather to give a thorough analysis of the various forms of a single disease in different patients. That was the specific feature of the facultative surgery course.

Burdenko's delivery lacked external effects. He spoke rapidly, as though afraid he would not have the time to share all his knowledge, thoughts and plans with us. To be frank, at the beginning we did not always appreciate him. Some students took such a poor view of his lectures that they often gave them a miss, staying at home or going to the cinema.

Burdenko was not unduly discouraged by the empty seats in the auditorium. He rightly considered that those who wanted surgical knowledge would be sure to come. And those who did not were not worth persuading. Especially since in those years attendance of lectures was not compulsory.

Once a comical incident occurred to the student Nikolai Sychov, today head of a medical school department. He managed to miss every one of Burdenko's lectures and came to take the exam armed

with the information he gained from the textbook. At the entrance to the clinic he met a burly man in a white doctor's smock and asked him: "Can you tell me where Burdenko is holding examinations?"

"His study is on the first floor. Go on, I'll tell him you are waiting for him," was the reply.

Can you imagine Sychoy's discomfort when, several minutes later, the self-same man walked into the office and took his place at the desk? Nikolai was so put out that he fled without taking the exam.

Burdenko became really inspired when he examined a patient with his students. Up to 50 students would accompany him on his rounds, plus a couple of dozen doctors. Followed by this retinue, Burdenko would enter the ward.

It took Burdenko several hours to make his rounds of the wards on one floor, which meant some 60-80 patients. He would move from bed to bed slowly, lingering near the "difficult cases". Each of these patients excited his lively interest. He would suggest that additional analyses and novel investigations should be performed.

The students reported on patients assigned to them and were expected to express an opinion on diagnosis and proposed treatment. Burdenko would be sincerely overjoyed when a student demonstrated a capacity for independent thinking and drawing conclusions. When an operation was suggested, Burdenko demanded a most detailed substantiation. He became very much displeased if, say, one of us recommended an amputation for an infection of blood vessels in a limb.

"Are you sure you have taken account of everything, young man?" He would ask stiffly. "You would do better thinking about how the leg can be saved."

Once, after examining "my" patient (with inguinal hernia), Burdenko set a date for an operation and told me to get ready to assist him. This was to be a demonstration-operation. Knowing how much importance he attached to the assistant's proficiency with the instruments, I started training assiduously in the operative surgery department where we were mastering operational techniques. At home at the hostel, I would spend hours tying knots and learning to handle clamps and scissors with dexterity, disregarding my room-mates' raillery. I made a thorough study of the structure of the groin, tracing the muscles, nerves, blood vessels, and the spermatic cord.

At last the day of the operation came. The patient and I were equally nervous and comforted each other on the way to the

operating theatre. I washed my hands, pulled on rubber gloves, put on a sterilised smock and began cleaning the area of the operation. In my eagerness, I poured too much iodine into the groin. The patient fidgeted. Burdenko came over, glanced at my doings, shook his head and began swabbing off the excess of iodine. Then he indicated my position to me with a nod.

The professor went about the operation unhurriedly, making it a real demonstration lesson. As for me, I was in such a state of nerves that he had to tell me several times to take myself in hand. The thread kept slipping out of my fingers and I just didn't seem able to tie up a vessel. The scissors fell apart in my hands, and when Burdenko told me to sew up wound, needles began to break one after another in my hands. I was sweating with strain, and the overhead lamp made me hotter still. I do not remember how the operation was brought to conclusion. Then I heard Professor Burdenko telling me:

“A good show!”

I stood there in confusion, as depressed as a first-former who had failed to do his homework. My comrades smiled at my embarrassment—they had seen well enough what kind of a show I had put up.

Soon after that I began assisting surgeons at emergency operations on ambulance cases. The surgeon in charge was always willing to use students as assistants. Noticing my interest in surgery he advised me to make myself useful at the polyclinic. “There you'll learn to perform simple operations, such as applying sutures, removing lipomas, opening up abscesses, and the like.” Thus, via “small surgery” we were gradually broken in.

Once our extreme eagerness almost brought disaster. We were riding to the clinic on a tram and saw a man with a big lump on his head. We decided we must talk him into coming to the clinic with us. “We'll remove that lump of yours in no time,” we argued. “Why should you have your face disfigured by it.” The man hesitated for a while and then agreed.

At the clinic we called in the surgeon on duty. He gave the man a cursory examination and told us to prepare him for an operation. “Go on,” he said, “I'll be along as soon as I'm through with my rounds.”

We washed our patient, gave him clean linen, shaved his head and put him on the operating table.

We prepared the area of operation and were about to give him a novocain injection at the site we were going to open up. At that point Burdenko walked into the operating theatre. He sauntered

over to the table, picked up the anamnesis, read it through and then asked:

“Have you had the skull x-rayed?”

“No,” we answered in dismay.

“Then wait with the operation! How could you put the patient on the table without doing the most important examination? Who taught you that?” Burdenko demanded indignantly.

We kept an abashed silence, removed our gloves and smocks and took the patient to the x-ray room. Then we brought the wet film to the professor. He pointed out a defect in the skull underneath the “lump”.

“See, the patient has a congenital hernia of the brain. It cannot be removed just like that. You could run into bad trouble. And I could land in prison on your account.”

Several days later Burdenko skilfully removed the “lump”. We all assisted him and, of course, fell over backwards to make up for the stupid mistake we had nearly made.

Those lucky enough to have been instructed by Burdenko could not but become infected with his love for surgery. No wonder many of us decided to specialise in this particular field. I was attracted to surgery as well. At the same time I developed an interest in another field—pathological anatomy.

### **Scientists, Teachers, Instructors**

In pathoanatomy Alexei Ivanovich Abrikosov “reigned supreme”. His scientific career started long before the October Revolution. He also founded the Soviet school of pathoanatomy. A close connection between pathological anatomy and practical health protection was one of the mainstays in this school.

Abrikosov was a versatile and very gifted scientist. He generated new ideas in various medical fields (works on tuberculosis, pathology of the vegetative nervous system, studies of tumours, osseous pathology, etc.). His doctor’s thesis “On the Primary Anatomical Changes at the First Stage of Pulmonary Tuberculosis” had a great practical significance. The thesis stressed the significance of complex therapy in the treatment of tuberculosis and ascribed particular importance to the patient’s social conditions.

Abrikosov was also a talented teacher. Not that he was eloquent, but his lectures were profound, pithy and clear and his auditorium always full. His textbooks were used by several generations of medical students.



Academician A. I. A b r i k o s o v

Abrikosov championed close collaboration between pathological anatomy and clinical disciplines, considering this to give new possibilities for developing both theoretical and practical medicine. He was by rights regarded as the country's leading pathologist. His standing was so high that important specialists came to consult him from other cities of the Soviet Union and even from abroad.

Abrikosov gave much of his time to training pathologists. After the Revolution a post-graduate course was instituted at higher educational establishments. Graduates were accepted who had worked well and showed an ability and inclination for research and teaching. Every year Abrikosov would take on some 5 to 7 post-graduates plus several people sent in from other medical schools.

He had a truly fatherly concern for his post-graduates. He insisted that they not only conduct theoretical research but also do actual autopsies at city hospitals. He regularly demonstrated autopsies in the presence of young doctors. These were of inestimable value to us.

The clinical and anatomical conferences which Abrikosov introduced furthered scientific advancement of both clinical doctors and pathoanatomists. Thanks to him, comradely cooperation was established between these two categories. Major figures in medicine like Burdenko, Konchalovsky and Molchanov attended the demonstration autopsies. Almost all heads of departments at the First Medical Institute contributed to the clinical and anatomical conferences.

Abrikosov concerned himself both with his young colleagues' professional advancement and their political and social development. A prominent scientist, he never divorced science and pedagogy from social activities. For twenty years he was a deputy of the Moscow Soviet, where he was very active in the Medical Section. He was also Chairman of the All-Union Society of Pathologists.



At the Sixteenth Congress of the Communist Party Abrikosov reported on the condition and prospects of Soviet medical science. He was among the sponsors of the Academy of Medical Sciences and its first vice-president.

The Communist Party and the Soviet Government showed their appreciation of his activities by awarding him the Orders of Lenin and the Red Banner of Labour, and in 1945, on Abrikosov's 70th birth day, the honorary title of Hero of Socialist Labour was conferred on him.

I became so absorbed by pathological anatomy that I would often go to the autopsy room, even on Sundays to help the assistant in his work and write out autopsy reports that he dictated. Abrikosov noticed my interest and suggested that I do a post-graduate course in his department. There was quite a lot of time left to make up my mind.

The Hospital Surgery Department was headed by Alexei Vasilyevich Martynov, an outstanding surgeon and founder of a large school. His name was well known abroad and he was often invited to deliver lectures or read papers in various countries. Martynov was the leading clinical surgeon. When Academician Ivan Pavlov had to undergo an urgent operation in 1925 (for a disease of the bile ducts) he asked Martynov to perform the operation. Martynov did it brilliantly, and as a token of gratitude, Pavlov dedicated one of his monographs to him.

The auditorium was always filled to capacity at Martynov's lectures. We used to greet him standing. He would walk to the rostrum with his weak, old man's gait, stooping a little and bowing as he walked. But when the lecture began, he was transformed.

We now saw a vigorous and concentrated speaker who completely held the attention of his audience. During a lecture he would examine the cases of different patients, paying special attention to signs by which a disease can be recognised, the need to operate and the post-operative treatment. Martynov made a personal selection of cases and patients for demonstration, making a detailed study of their case histories, x-ray pictures and laboratory data.

Patients suffering from the most diverse ailments passed before us. Alexei Vasilyevich was an extremely sensitive man and asked them questions with amazing tact. There was nothing in his words that could frighten or upset the patient.

We would be so carried away by his analysis of complex and interesting cases, that we would ignore the bell marking the end of the lecture. On a number of occasions, aware of our reluctance, the

professor went on with his lecture until the teaching head came along to remind him that lecture-time was over. Alexei Vasilyevich would then say a hasty goodbye with a slightly embarrassed air and go to his study.

The diagnosis, Professor Martynov kept saying is the main thing in surgery. The decision whether to operate or not, and if so, when, depended on it. These ideas lay at the basis of the hospital surgery course and were the guiding lines in the instruction given by his assistants who trained us for practical work.

Professor Martynov invariably began his lectures with a report on the condition of patients who had been demonstrated at preceding lectures and had since undergone an operation. He would draw the various stages of the operation with charcoal on a glass board. Some of those drawings would have gone well in any atlas of operative surgery.

Nor did Professor Martynov tell us only about successful operations. He would be quite frank about his own mistakes in diagnosis and in operative treatment. He did this to impress on us young surgeons, the need for treading with care where even experienced surgeons were apt to commit errors.

In the presence of students Professor Martynov would often do the most responsible dressings himself, and once a week he received outpatients, also in our presence. He attached great importance to sessions in the outpatients' department, where students had a chance to see many patients similar to those they would come across when they started independent work. He insisted that a student should himself make a diagnosis and prescribe treatment. If he made a mistake, the professor would correct him in a gentle and tactful manner.

We were also acquainted with methods of examination and treatment of patients with maxillofacial and urological disorders.

In a word, studies in the hospital surgery department were to acquaint us with the great variety of surgical ailments, teach us methods of examination and develop our ability to find our bearings in the multitude of diseases.

A practising physician must also have a good knowledge of clinical subjects like psychiatry, nervous disorders, traumatology and orthopaedics.

Our lecturer in psychiatry was Professor Pyotr Borisovich Gannushkin. He had us so fascinated by his subject that we begged him to give us additional lectures, even though we medical students already had an extremely tight schedule.

Even before the Revolution Gannushkin worked selflessly to improve the organisation of mental homes and other services for the mentally sick and elaborated problems of social psychiatry. At an early period of his career he strongly opposed, with other progressive young psychiatrists, against the obsolete concept of incurability of mental disorders. Later he became one of the founders of Soviet psychiatry. He trained many young psychiatrists, generously sharing his knowledge with them and his experience. He never tired of drawing their attention to the importance of a healthy social environment and the correct organisation of work and life to prevent mental disorders. He was a talented diagnostician and knew how to inspire confidence in his patients. One needed to see how eagerly they awaited the professor's visit.

Sometimes we were lucky enough to accompany him on his unofficial evening rounds. Their purpose was not administrative, nor to check on the staff, but to talk with patients in an informal atmosphere. With one patient he might talk for a full hour and with another, just ask a couple of questions. Some he would listen to without interrupting, while others he would stop, correct and cross-question. Gannushkin almost never asked a patient how he felt. He would seem to be talking about completely extraneous subjects, about his job, books, art, current events. But the patient's responses gave him an insight into his mental condition and the degree of his derangement.

Gannushkin's striking feature as a diagnostician was that he did not attach too much importance to disjointed symptoms characteristic of various disorders. He tried to get to the bottom of an ailment, to the very core of the affection's mechanism.

In examining a patient at a clinical conference Professor Gannushkin never followed a set pattern. He endeavoured to talk to the patient as he would in his office. This helped to give us students a picture of the disease.

Gannushkin's clinic made wide use of occupational therapy. We were able to watch many patients ridding themselves of obsessive ideas by working with their hands. Work helped them overcome severe conditions and eventually return to useful life.

"To talk to mental patients," Gannushkin told us, "the doctor must have a specific personality and a lot of intuition as well as knowledge and experience. There are some very erudite and experienced psychiatrists who are unable to win a patient's confidence. The secret lies in a sincere and thoughtful interest in the patient, and in a natural easy manner. Patients never forgive a doctor hypocrisy, falseness and sugariness."

"The world's best psychiatrists," Pyotr Borisovich noted, "the German Kraepelin, the Frenchman Magnan and the Russian Korsakov, were past masters at talking with patients and obtaining the necessary information from them."

When Gannushkin talked to a patient, the latter felt that this conversation was more than just routine, that his story was interesting, even fascinating to the doctor. Gannushkin never put on a poker face, he would laugh, sympathise, even get angry, sharing all the patient's happenings in the story. This made the patients trust him and open their hearts to him. Being a very sensitive, tactful and kind man who understood the inner workings of the human soul, he made a striking impression even on people who bore him ill will. It was no accident that he became the prototype of characters in several works of fiction. The image of the psychiatrist in Leonid Leonov's novel *The Thief* was largely based on Gannushkin. The great actor of the Arts Theatre Mikhail Chekhov left a very warm description of Gannushkin in his memoirs.

We students flocked to Gannushkin's lectures and loved to attend his rounds at the clinic and receptions at the outpatients' department. Psychiatry lectures were scheduled for the afternoon. It would be dark in the auditorium. A lamp with a green shade would be placed on the rostrum. Gannushkin delivered his lectures sitting in an armchair. His voice was soft. Before showing us a patient and questioning him in our presence, he would discuss some general propositions, sometimes citing the opinions of his opponents and showing their fallacy.

In his lectures Gannushkin repeatedly stressed the difficulty involved in diagnosing a mental illness. Every one of them, at some stage, would hover between health and illness. Even during its normal development a human personality undergoes fundamental changes, sometimes becoming utterly unrecognisable. Were it possible to embody every phase of a person's mental development in a separate individual and were they all brought together, they would make a motley group whose members would often hold opposite views and even harbour a hearty dislike for each other. In pathological conditions, naturally enough, the changes in the psyche are even more deep-going.

Our studies in psychiatry over, we passed on to the nervous diseases clinic. Here we were met by a thin man of medium height with a lofty forehead and hair combed straight back.

This was Yevgeni Konstantinovich Sepp, an outstanding neuropathologist, and author of many important works forming a sizeable contribution to neuropathology. He was the first to make

the history of the nervous system's development part of the neuropathology course, showing how new functions of the nervous system emerged under the influence of the changing conditions of life and how, in their turn, they change the structure of the brain.

Y. K. Sepp elaborated the teaching on protecting the nervous system against infection and established the principles underlying these defence reactions. He was not a brilliant speaker, but his lectures and talks awakened the thought and induced one to go deeper into the subject. Sepp was a truly remarkable person, a thinker, a talented pedagogue, an outstanding clinician and an active public figure. From the first days of the Revolution he took part in setting up a national health-protection and medical training system.

Like Konchalovsky, Sepp tried to interest his students in social sciences. Possessing a thorough knowledge of philosophy he helped us study the classics of Marxism-Leninism and conducted a students' seminar in philosophy. His seminars helped us to digest the lectures on dialectical materialism.

Professor Sepp strove to demonstrate the dynamics and various forms of the physico-chemical processes which underlie most pathological conditions. He cautioned us against using ready-made formulas in making a diagnosis, and stressed the need to study every patient and his every individual trait. Sepp's attitude to patients was a model for all of us: "A patient is not material for study but a suffering human being who needs our help."

He spoke to his patients warmly and gently, but could also be firm when the patient needed his willpower built up.

New subjects kept cropping up on our timetable. They were traumatology and orthopaedics, forensic medicine, children's diseases, social hygiene, etc.

Professor N. N. Priorov, who lectured on traumatology, introduced his course thus:

"Sooner or later, my friends, all of you will have to take up my subject. Remember we are building a socialist state in capitalist encirclement and there are bound to be provocations. And suppose a war breaks out.... A war is an epidemic of traumas. Then you will be racking your brains, trying to remember everything you had been taught in this field, dressing wounds, amputations, applying plaster casts and splints, and, finally, artificial limbs. Therefore, my dear colleagues, you must acquire a good knowledge of my subject."

Nikolai Nikolayevich Priorov had done a lot of research in field surgery and sanitary procedures. He was regarded as a pioneer in prosthesis construction, a leading specialist in the treatment of limb injuries. Back in 1921 he was put in charge of treating World War I and the civil war invalids. It was then that he set up the Research Institute of Traumatology and Orthopaedics which was later to become a national research and methodology centre.

- Professor Priorov's prestige in traumatology stood very high, and when the question arose of organising qualified surgical aid to the wounded at Khalkhin-Gol and later, during the Finnish war, this responsible task was entrusted to him.

In 1930 the Soviet Union's first Department of Sanitation and Hygiene was set up at our institute. Its task was to train specialists to conduct sanitary and preventive work.

### **The Republic's "Head Doctor"**

A chair of social hygiene and occupational diseases was established at our institute and held by Nikolai Alexandrovich Semashko, the first People's Commissar for Health of the Russian Federation.

Semashko read us a course of lectures on social hygiene. The overriding idea of his course was that the primary task of medicine was not to diagnose and treat diseases but to prevent them, especially social and infectious ones.

"Prophylaxis is not a narrow concept," he urged us, "not the concern of health protection bodies alone, but an expression of the Soviet state's concern to improve the population's health."

The prophylactic trend in medicine was, in his opinion, Soviet power's main achievement in health protection. In one of his works he wrote: "The accent on prevention is not a chance phenomenon but a logical consequence of Soviet power's concern for the working people's health." Therefore, he reasoned, prevention was the responsibility of other state organisations as well as health bodies.

This definition of prophylaxis' aims and its place in the health protection system was new to us. In fact, it was only from Semashko's lectures that we got an inkling of the great importance of preventive medicine.

At his lectures and seminars Semashko taught us to consider social and hygienic aspects in their relationship to the various fields of practical medicine. Therefore the examination in social hygiene rather resembled a friendly discussion, with questions asked by



N. A. S e m a s h k o, the "Republic's Head Doctor"

both sides, conclusions drawn together and even arguments arising on occasions. Semashko wanted us to gain a thorough understanding of the meaning of this new trend. You must remember, he pointed out, that the essential social and hygienic measures could be implemented only because Soviet power had prepared the soil for them.

Although the examination seemed so casual an affair, it did not occur to anybody to try and pass it without preparation. Cheating Professor Semashko was out of the question. Too great was his authority as a scholar, Communist and Lenin's comrade-in-arms.

Nikolai Alexandrovich's life had been the hard one of a revolutionary, with imprisonment, exile and emigration. On his return to Russia he worked with the other Bolsheviks to prepare the October Revolution. After Lenin signed the decree on the organisation of the People's Commissariat for Health, Semashko was appointed "the Head Doctor of the Republic". For the first time in history a central state organ was set up to direct the entire work of medical aid and sanitation in the country.

Semashko took up his duties as the People's Commissar in the difficult conditions of the civil war, intervention, famine and economic dislocation. Epidemics of typhus and other severe diseases ran rampant. Lenin and the Party attached great importance to health protection. Semashko reported all fundamental

measures and enactments of the People's Commissariat for Health straight to Lenin. And the basic principles of Soviet medicine always found a supporter in Lenin. Lenin demanded the mobilisation of all the country's resources to combat infection. He saw a direct relationship between the health of the working people and the fate of the young Soviet state, the fate of the revolution. He regarded care for the people's health as one of the main concerns of the Soviet state.

It would be no exaggeration to say that there was no aspect of health protection to which Semashko did not make an important contribution, be it organising the network of medical institutions, preventing disease, or mother and child protection. He also did a lot to introduce the latest achievements of medical science. He considered that the development of medical science should be planned on a national scale, proceeding from the vital needs and interests of the people.

The "Head Doctor's" primary concern was organising higher medical education and training Soviet doctors.

Under the guidance of such a talented and energetic person the new sanitary-hygienic department grew and developed apace and soon acquired the same stature as the curative section which had been established many years before. To be sure, at the beginning there were difficulties with enrolment. Most young people who entered the Medical Institute wanted to be doctors who treated diseases and had no idea of the great tasks facing doctors in hygiene. So at first the department had to content itself with the left-overs from the other faculty, who had not passed the entrance examinations well enough. However, this practice was soon discontinued, and examinations were taken separately for the two departments.

Subsequently, graduates from the sanitary-hygienic department were on a number of occasions offered a job as an internist or obstetrician. There were no takers. Every graduate from the sanitary department, after six years of study and a term of work as an epidemiologist, food-controller or industrial doctor, became a great enthusiast for his profession.

Semashko regarded sanitation and hygiene to be essential aspects of medicine, he called hygienists the advance column who led the entire medical army into the battle for the population's health.

Semashko remained People's Commissar for Health until 1930, when he was transferred to the Presidium of the All-Union Central Executive Committee, where he headed a commission which was charged with the improvement of children's lives.



The state examinations arrived.

The appointments commission posted some graduates to the provinces, and others to hospitals and polyclinics in Moscow. Those who had worked in student research groups and had shown ability were recommended for a post-graduate course. My intention was to go and work in the countryside and I told the commission so. But Secretary of the Party Bureau B. M. Bichman, who was on the commission, said she thought I should be recommended for post-graduate study in one of the theoretical departments. Professor Abrikosov, she informed the commission, thought I should specialise in pathological anatomy. So I became a post-graduate.

Shortly before graduation my application for membership of the Communist Party was accepted.

Mikhail Chumakov also stayed on at the institute as a post-graduate. Some time later he went with a group of virologists to the Far East to study encephalitis, a little-known disease at the time. There, in the centre of the epidemic he discovered the disease-carrier, the tick. But an unforeseen accident interrupted this promising work. While saving a collection of ticks during a flood, Chumakov became infected. Two more members of the expedition, assistant Utkina and research worker Kagan, also caught encephalitis. Everything humanly possible was done to save their lives. They even tried the serum Mikhail had obtained from a man who had survived the disease. But despite their youth and the doctors' heroic efforts, the two young women died. Chumakov won his battle against death, but lost his hearing and could not use his right hand. A man of iron will and relentless perseverance, he continued research and subsequently discovered several viral haemorrhagic fevers\* in various regions of the country; he also played an important role in fighting poliomyelitis in the Soviet Union.

Professor Mikhail Petrovich Chumakov is now member of the Academy of Medical Sciences, and a winner of State and Lenin prizes. His research is well known in our country and abroad.

Many of my fellow-students became prominent scientists. Among them are the microbiologist V. I. Vashkov, the ophthalmologist E. M. Belostotsky, the pathologist R. D. Stern, the surgeon I. V. Shmelev, the obstetrician O. V. Makeyeva, and others.

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\* Haemorrhagic fevers are viral diseases in which the smallest blood vessels begin to ooze blood. (*Author's note.*)

## IV. THE ROAD INTO SCIENCE

*There is nothing more shameful than  
being useless to society and to oneself.*

*B. Pascal*

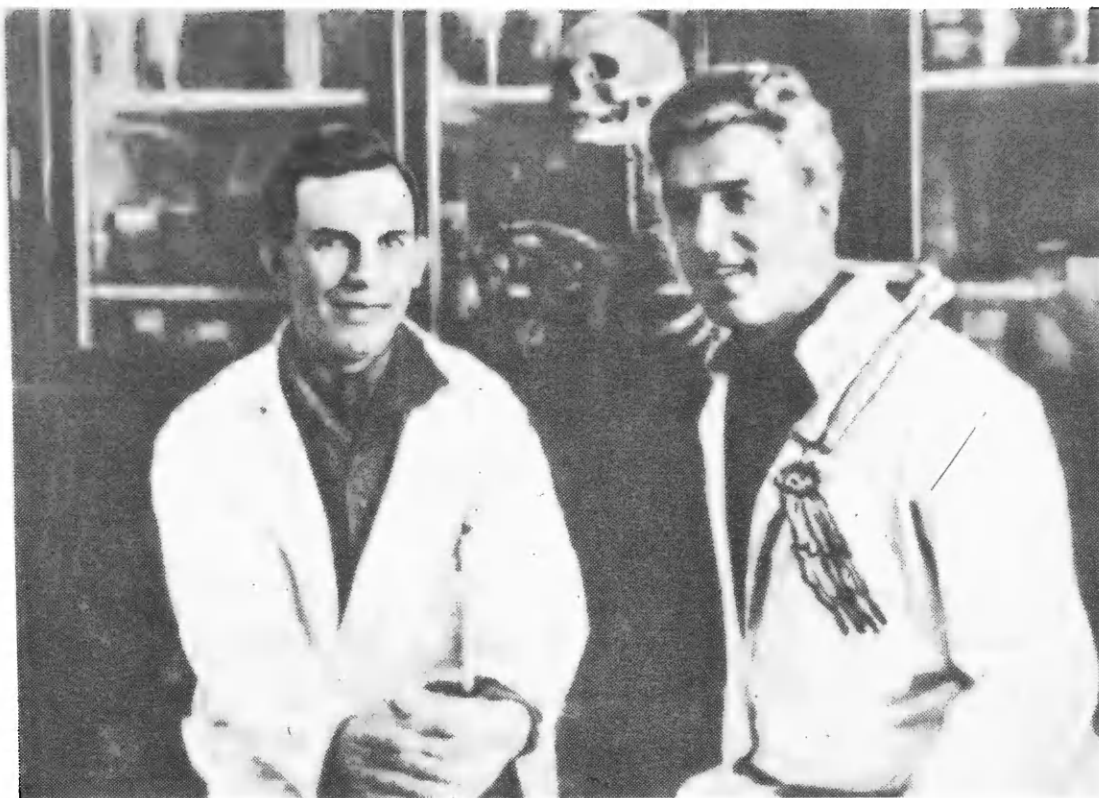
### My Post-Graduate Studies

Three of us were accepted for a post-graduate course in the pathoanatomy department, A.N. Fedorov, T.F. Janumov and I. Though the same age, we were very different in character.

Janumov was a typical southerner, hot-headed and temperamental. He found it hard to sit poring over the microscope for long and he would call us over excitedly ever so often to see the sensational discoveries he had made while studying the slide. Fedorov was Janumov's exact opposite, calm, sedate, unemotional. He quite enjoyed being the wet blanket on our friend's enthusiasm.

For all that, we were great friends, genuinely fond of one another, though forever pulling each other's leg. We studied pathological anatomy with great fervour. Moreover, we discovered we had to concentrate on our German, too, for the bulk of the literature on pathological anatomy was published abroad in the language of Rudolf Virchow and Otto Lubarsch, the greatest pathologists in the world.

Abrikosov gave us a lot of his time. Once a week he held a demonstration autopsy specially for our benefit, making a detailed analysis of the treatment the patient had been given, the causes of the disease and the reasons for its fatal outcome. One day was laid aside for work on anatomical specimens which were brought to him for consultation from all over Moscow. These sessions contained an element of competition—who would make the right diagnosis. We submitted our conclusions in writing, the classic tradition. When we made a mistake, we had to look anew at dozens of slides, until we discovered its origin. This helped us to find our way in tissue slides. We enjoyed these difficult lessons, which taught us to think and enriched our knowledge.



Post-graduates A. Fyodorov and V. Kovanov at the museum of pathological anatomy. The skeleton's embrace is really a symbol of future life-long dedication

We were aware that we had chosen a very exacting profession. Pathological anatomy is considered the basis of all clinical disciplines. The position of a pathologist is very special: he presents the final judgement. During the autopsy the diagnosis made during the patient's lifetime is either confirmed or rejected, and the pathologist also voices his opinion on the correctness of the treatment. His is the last word which cannot be debated. At the same time Abrikosov urged us to remember that a pathologist was, first and foremost, a doctor.

"The autopsy is not a court of law, with one doctor acting the accused and the other the prosecuting counsel," Abrikosov often repeated. "Two doctors take part in it on an equal footing. Both have the same interest at heart—to make a deep analysis of the course of the disease and the method of treatment, in order to avoid mistakes in the future."

One cannot become a fullfledged pathologist without a thorough knowledge of clinical disciplines and methods of treatment. We liked nothing better than going with Abrikosov to the clinic and accompanying Professor Konchalovsky on his rounds.

We had to be very careful, too, to avoid upsetting the patients. If Abrikosov evinced a special interest in a patient, his neighbours

became convinced that the latter was no longer for this world, for the job of "that doctor", in pince-nez and with a large bald head, was to cut up corpses. Foreseeing this kind of reaction, Abrikosov usually asked Konchalovsky to examine one patient after another without discrimination. Abrikosov was only too ready to learn from clinical doctors, holding that it was much easier to make the diagnosis on the autopsy slab, than at the patient's bedside.

### Our Ivan Glebich

There were occasions, to be sure, when certain clinical doctors tried to make use of our insufficient knowledge of pathological anatomy and to confuse and baffle us during an autopsy.

I remember an occasion when I felt completely helpless defending the correctness of my diagnosis before clinical doctors. I said: "Can't you see these cancerous nodules in the abdominal cavity? That means their origin is to be sought in the bronchi."

"Why don't you demonstrate it to us?" asked a clinical doctor slyly, thereby putting me in a very embarrassing position, since I had arrived at my diagnosis by pure logic. Suddenly I felt somebody give me a nudge. I looked round and saw Ivan Glebich, our old laboratory assistant, showing me a bit of lung tissue he held in a pair of pincers. At first I could not understand what he meant, but looking closer at the bubbling slice of lung tissue I discerned a cancerous nodule. This was irrefutable proof. The clinicists were routed.

Ivan Glebich Trofimov had come to pathological anatomy department as a seventeen-year-old country lad, who had no education and no trade. He was assigned the job of bringing in and taking away the cadavers. All one needed for this kind of work was physical strength and a lack of squeamishness. During the autopsies he was supposed to help the pathologist in the physically difficult work—sawing through the bones, opening up the skull, and, finally, taking samples for analyses. He was also to prepare everything needed for the next autopsy. So, day after day, watching doctors at work, the young man had learned the secrets of his difficult job and gradually obtained a vast practical knowledge, often on a par with qualified doctors. A man of considerable natural gifts, he became irreplaceable in the autopsy room.

Ivan Glebich often came to our help. In difficult situations he would suggest the necessary argument, especially when it was primary cancer in an organ.

Trofimov also showed us autopsy techniques, warning against possible dangers, watching that we always wore rubber gloves and aprons, becoming angry when we neglected "safety measures". For our part, we were sincerely fond of this gifted and kindly man.

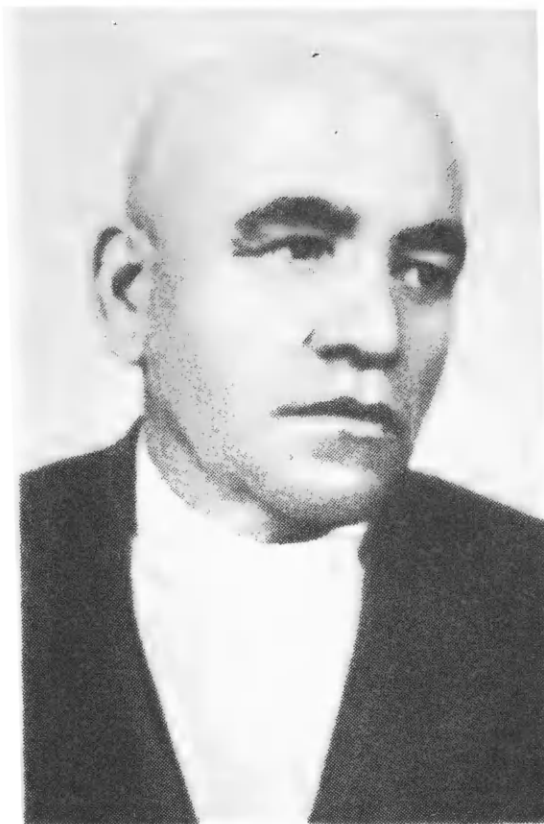
Ivan Glebich was not only in charge of the autopsy room, but also supervised the museum of study aids and anatomical specimens. Room was found at the museum for our three desks, and so we were constantly in Glebich's presence and became attached to him as if he were a kind uncle. He taught us to prepare solutions to conserve organs and to make slices from bits of tissues frozen with carbon dioxide.

We would spend long hours at the morgue, treating autopsy material or writing our conclusions on the cases. Ivan Glebich would stay on with us helping us get ready for the professor. Each autopsy report had to be thoroughly substantiated with data from a microscopic examination of the tissues.

"Why haven't you taken a sample of the kidney?" Ivan Glebich would suddenly ask. "After all the man died of kidney insufficiency."

We scratched our heads, sighed and promised to correct our ways. But if we earned Ivan Glebich's praise, "Well done, boys", our hearts were full of gratitude.

Trofimov remembered by heart every specimen exhibited at the museum, and there were about three thousand of them. They are still there today, row upon row of glass jars ranged along the shelves in accordance with the accepted classification of diseases. All man's illnesses are represented here. There are the lungs of a tubercular patient with the characteristic changes in the tissue, sections of necrosis and suppurative cavities; there are kidneys distended with stones, with full atrophy of the cortical matter;



Ivan Glebovich T r o f i m o v,  
veteran worker in the patho-  
logical anatomy department

degenerate tissue of the liver; a heart with ventricle walls of thickened muscle and deformed valves, etc. There is a unique exhibit, a pair of Siamese twins who had no legs or arms and only one eye. A huge jar contains a large part of a human torso. The man was a real freak—he had two sets of genitals and, on top of it, a third undeveloped leg. Back in 1915, he came to Professor Martynov, asking him to remove this third leg. Martynov agreed. The operation proved extremely complex and lengthy, and the patient did not survive it. In this way a truly amazing exhibit made its appearance in the museum.

For the most part the department owed its unique collection of preparations to Ivan Glebich's efforts. He helped Professor V. T. Talalayev develop a new method of making laminar preparations placed between two glass plates in agar-agar. Today this method is widely used in training medical students.

Ivan Glebich was Professor Abrikosov's right hand. When Abrikosov was entrusted with embalming the body of Lenin, he took Ivan Glebich along. For his part in this work Trofimov was awarded the title of Hero of Labour and a diploma from the Supreme Soviet of the USSR.

A meeting was held in the department to mark the occasion. Doctors from all the city's medical institutions as well as the institute's clinics came to pay homage to our veteran. And no wonder, since several generations of doctors owed him so much in one way or another.

### **Pavlov's Wednesdays**

In my second year as a post-graduate (in 1932) Abrikosov decided to send us to Leningrad to acquaint ourselves with the pathoanatomical schools of that city and to visit the laboratory of Ivan Petrovich Pavlov. He gave us a letter of recommendation to the great scientist, asking his permission for our presence at the experiments conducted in his laboratory.

You can imagine how impatient we were to meet Pavlov and see his laboratory. At last the long awaited day came.

The unremarkable-looking two-storey building housing the laboratory stood in the grounds of the Institute of Experimental Medicine. We entered it with a feeling of holy awe and found ourselves in a spacious reception hall. The floor was of gray concrete, the furniture of the simplest kind, the ceiling and the walls

needed a coat of paint. Wooden dog cages lined the walls. We gazed around with curiosity. The austerity of the surroundings seemed incongruous in the sanctum of a world-famous scientist. Soon Ivan Petrovich came down a spiral staircase. He looked familiar from his many portraits and he was very angry. He paced back and forth across the hall scolding somebody for stupidly bungling an experiment and losing a dog.

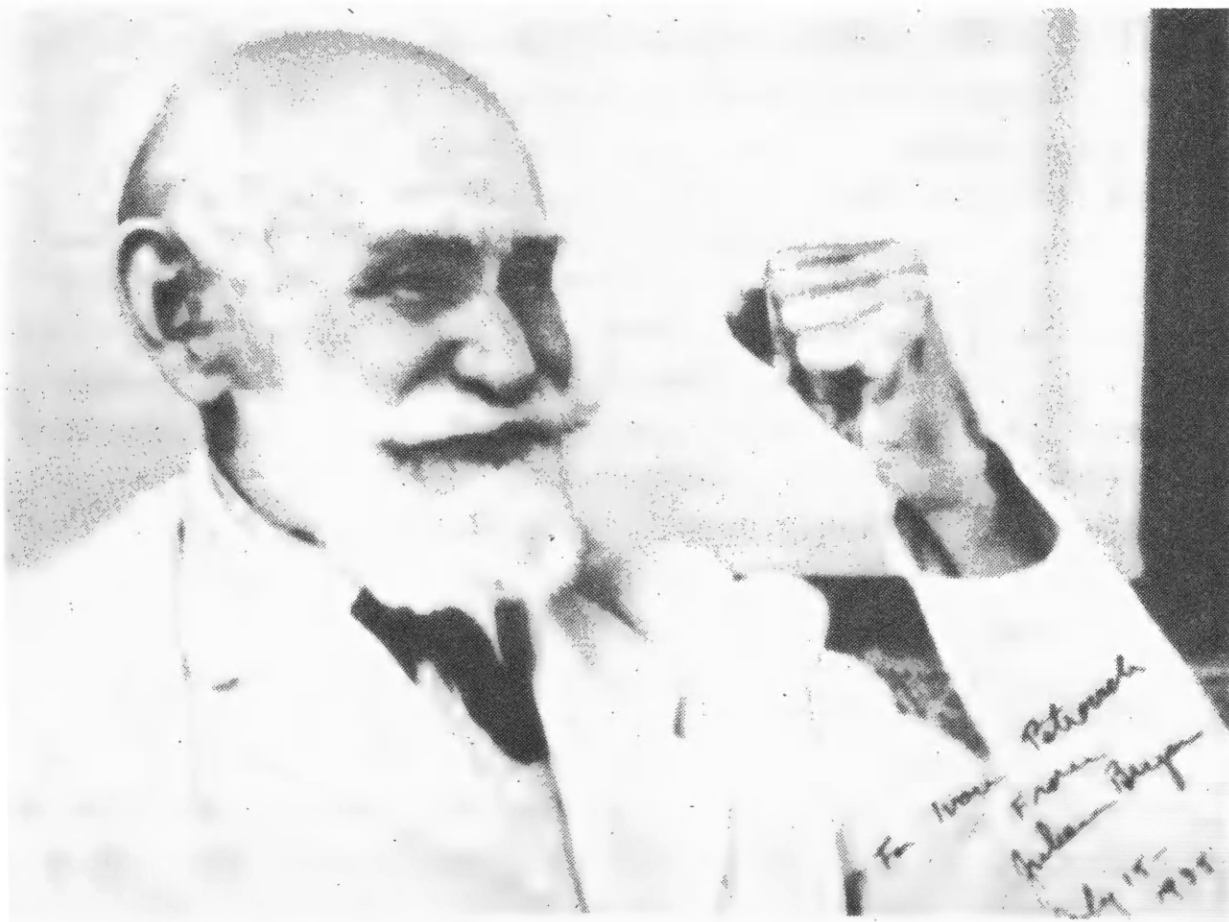
Then he stopped in his tracks and stared at us inquiringly. We mumbled some incoherent explanations, and, snatching at a phrase of mine, "We would like to take a look at the laboratory", he transferred his anger to us.

"This is not a circus, nor a theatre, young men. You'd do better to go to Nevsky Prospect or somewhere else, there are any number of interesting sights in the city. And here we have work to do. Good-day!"

He turned on his heels and dashed up the staircase.

We stared after him, completely at a loss, and then decided to go to Professor N. N. Anichkov, Abrikosov's friend. He received us in his office in the Naval Medical Academy.

Professor Anichkov had devoted his life to studying the pathology of the cardio-vascular system, particularly atherosclerosis, which is one of the principal causes of



Academician I. P. Pavlov, England. July 1935



Memorial to a dog sacrificed to science  
(erected on I. P. Pavlov's initiative)

premature death. The concept of the causes and development of the atherosclerotic process, built on the results of his experiments, has remained valid to this day. At that time Professor Anichkov was conducting experiments and collecting facts from which a very interesting theory had begun to emerge. His department was studying the effect increased doses of cholesterol, thermal factors, warmth and cold, and also increased or decreased physical loads had on metabolism.

Taught by bitter experience, we introduced ourselves at once and told Professor Anichkov about the reception Pavlov had given us. He was immensely amused.

"Very well, my friends, I see I shall have to help you for a start. I'll give you a list of questions you should ask Pavlov to make a good impression on him. But further on you will have to rely on yourselves. If you want to continue associating with him, you'll have to sit down and study his works. You don't know enough to argue with him, which he delights in, incidentally, but you must be quite capable of asking him intelligent questions."

This was exactly what we did. Several days later we paid Pavlov another visit. This time we were introduced by his pupil Professor P. S. Kupalov. We gave Pavlov Abrikosov's letter. On reading it he smiled and said: "I see, so you are future pathologists and not physiologists. Well, well, have you anything to ask me then?"

We were ready for that. As he answered our questions, Ivan Petrovich kept pacing the room, talking with animation about his work and the use that could be made of his experimental data.



Two hours flew by. We realised we mustn't detain the Academician any longer, but did not dare to take our leave. At this juncture Kupalov entered his office. Pavlov broke off in mid-sentence and said to him:

"Look here, Pyotr Stepanovich, they're bright lads, these post-graduates of Abrikosov's. They've been asking me very clever questions. Please show them around our place."

After that we became frequent guests at the laboratory and were even invited to Pavlov's famous Wednesdays. This was an excellent opportunity for us to improve our minds and we were extremely grateful to Anichkov for his help.

Pavlov's Wednesdays bore no resemblance to a scientific conference or session. Rather, they were friendly discussions, an exchange of opinions between co-thinkers.

Usually Ivan Petrovich gave a short introduction, then they discussed the problems he posed in connection with experiments recently staged, the new facts that had emerged, and the changes that had occurred in the animal's behaviour in response to different irritants. All the experimental details were examined, the data obtained were compared with those obtained previously. During the discussion Pavlov would inform the gathering about the work which had been done at other laboratories.

Sometimes, after a lively exchange of opinions and sometimes even an argument, they would start what they called "thinking aloud". Ivan Petrovich would sink deeper into his armchair, adopting a relaxed pose and interlocking his fingers. A new working hypothesis would often be born during those minutes. It would be discussed from all angles and the missing links would later be supplemented with new experimental data.

Pavlov harboured a deep dislike for any kind of unverified, superficial conclusions and generalisations. His own thinking rested on a massive foundation of facts. He admitted he was not loth "to let his fantasy go", but experimental results, checked and double-checked, were the final measure of a hypothesis' truth. This scrupulousness made for the unassailable scientific value of the laboratory's output.

"It is easy to misinterpret an experiment," Ivan Petrovich used to say, "if the experimenter is prejudiced in favour of an idea."

He urged his pupils: "You must constantly doubt and check yourselves."

He did not mind his assistants "letting their fantasy go" at his Wednesdays, he even approved of it, so long as these flights of fancy were not a pretext for empty word-mongering.

Determined to get to the root of the nervous process, Ivan Petrovich kept returning to the problem of the relationship between excitation and inhibition. He referred to it as the “accursed question”, recalled his pupil, the prominent Soviet physiologist L. A. Orbeli. Was each of the processes independent and separate, or were they reversible—this was the great puzzle he strove to fathom out.

Ivan Petrovich sought to decypher pathological changes in the human psyche as well as the normal activity of the cerebral cortex. He would hold forth passionately against idealist theorising and empty “professorial” word-mongering.

Towards the end of the session they read aloud the latest articles by foreign scientists or works by the laboratory’s staff prepared for publication, including those of Pavlov himself.

Pavlov’s pupil L. A. Andreyev in his reminiscences described the discussion of the article “Conditioned Reflexes” written by Pavlov for the *Medical Encyclopaedia*. “Ivan Petrovich began ... with some general criticism of encyclopaedias, which, in his opinion, ‘were intended for loafers’, after which he said placatingly: ‘However, all kinds of people will read this article, those who know about the nervous activity and those who don’t. Well, my purpose was to have both categories learn something from it. This accounts for certain simplification, and the elementary character of the description.’ ”

The article produced a great impression on the entire gathering: Ivan Petrovich was a past master at writing both profoundly and at the same time clearly and simply.

There was another ritual included in the Wednesday programmes. A minute before midnight the discussion was stopped, all those present produced their watches (at that time most of the people carried pocket watches) and waited for the gunshot to mark midnight. Ivan Petrovich was overjoyed when his watch showed the correct time.

When we became better acquainted with the laboratory’s work we understood Pavlov’s reaction to our first visit. The thing was that his laboratory was veritably overrun with doctors and biologists who wished to associate themselves with “big science”. Some hoped to “do” a dissertation, others wanted to learn the methods of experimenting on animals. A few stayed on, carried away by Pavlov’s ideas on the physiology of digestion or the activity of the central nervous system.

Pavlov deeply resented being made use of, but for all those who had serious intentions, the doors of the laboratory were wide open.

Pavlov never grudged sharing his enormous knowledge, experience and ideas. He was never put off by the fact that his visitor may be poorly prepared for assimilating his complicated reasoning. Sometimes the novice would go away quite dazed. Pavlov would give him another talk or two, and then the new recruit, if found promising, was given an independent theme to work on.

Pavlov would give more attention to one of his workers and less to another, depending on his interest in the theme of their work. But no one could ever reproach Pavlov for giving somebody preference or providing better conditions for work. He would often repeat: "We are all harnessed to a common cart, and each pulls to the best of his ability."

### Scientific Schools

N. N. Anichkov, who had helped us to penetrate Pavlov's circle and inhale the creative atmosphere there, later did us another big favour—he introduced us to Pavlov's pupil A. D. Speransky. From his heated disputations, articles and passionate speeches at conferences we knew Speransky as an ardent polemist, who would uphold his scientific views with fierce conviction and youthful fervour. He had put forward a theory that all pathological processes originated in nervous reactions. Every pathogenic influence makes the nervous system mobilise its defence reactions. The task of the doctor, maintained Speransky, was to support the organism's resistance with timely and correct aid and thus help the recovery.

Speransky's theory suggested a new approach to the mechanisms of the development of various disorders and helped evolve new methods of treatment. One such method, for instance, consisted in intermittent extraction and infusion of the cerebrospinal fluid. This "massage" improved the patients' condition when they had severe spine and brain disorders. Another method, novocain blockade, proposed by A. D. Speransky and A. V. Vishnevsky became widely used.

On the basis of the ideas of nervism, Speransky elaborated a teaching on nervous trophics, proving the dependence of tissue metabolism on stimuli received by the nervous system and on its reactions to these stimuli.

Speransky's experiments demonstrated that pathological stimulation which causes changes in tissues can be traced to, for example, traumas of peripheral nerves. Cutting a nerve causes deep structural changes not only in the affected extremity but also in the symmetrical healthy one.

When we went to his laboratory, Speransky immediately invited us into the operating theatre where he and his pupils conducted experiments.

"If you don't mind," he said, "we shall talk after the operation."

Alexei Dmitriyevich Speransky was tall and broad-shouldered, with a slight stoop, and had a big head with close-cropped hair and the characteristic high forehead of a thinker.

He took his place at the operating table on which lay a narcotised dog. One movement of the scalpel and the dome of the skull was laid bare. What followed was very like an operation in a neurosurgical clinic—holes were bored in the skull, joined together with a Jigli's saw, a patch of bone was folded over, the dura mater was cut through and finally the gray hillock of the tuber cinereum at the base of the brain was revealed. Then Speransky took several glass balls, each a little smaller than a pea, and laid them on the tuber cinereum. After that he joined the cut tissues layer after layer, put the bone patch back in place and sewed up the skin. The operation was performed quickly and bloodlessly.

Two similar operations were performed in our presence and then the professor invited us into his office.

While he changed, we had a look round. The office was a spacious, slightly elongated room. A large desk was heaped with books and manuscripts. There was a bookcase, some chairs and two old armchairs. In the corner stood a cello and a music stand with sheets of music on it. Obviously Speransky was quite a musician. A peculiar feature of the office were rabbits hopping about and leaving their characteristic traces on the floor.

Alexei Dmitriyevich gave us some tea, then rose from his desk and started pacing the room, his hands behind his back, discussing the experiments we had just witnessed.

"You have seen me place foreign bodies in the region of the tuber cinereum," he said. "In a few days this dog will develop various pathological symptoms: ulcers will appear on the skin of the extremities and along the gastrointestinal tract, there will be haemorrhages in the lungs and the adrenal glands. What does this mean?" he asked and continued without waiting for our answer. "The animal will die of what is known as nervous dystrophy. A similar kind of pathological process develops when the stimulation is caused by specific poisons secreted by microbes....

"From these experiments we can conclude that any pathogenic agent, irrespective of its properties, has a characteristic effect on the nervous system which disrupts the body's vital functions.

“On the other hand, by influencing the nervous system we can substantially modify the course of the pathological process. Unless it has gone too far, we are able to check it and even terminate it altogether. This is the theoretical foundation of methods of pathogenetic therapy which are used in many disorders, including pyoinflammatory processes, in particular the method of influencing the nervous system through the novocain blockade.”

Many of the things Professor Speransky told us were in the nature of a revelation. The role of the nervous factor in the development of a disease had only been mentioned by our lecturers in passing or omitted altogether.

Our heads were in turmoil as we left the laboratory, and, to relax a bit, we went to the cinema.

During our stay in Leningrad we also had an opportunity to acquaint ourselves with the work of the prominent pathologist Professor G. V. Shor.

Professor Shor had developed a new method of post-mortem examination based on the topographico-anatomical principle. According to this method, the anatomical interconnection between the organs is preserved to the end of the examination. Shor's method was progressive for the time and helped to solve many problems of clinical treatment, pathological anatomy and forensic medicine.

This method had been adopted by Leningrad pathologists, but elsewhere autopsies were still performed according to the old Virchow system. In Moscow Shor's method was practically unknown. This, naturally enough, spurred on our desire to meet the professor and learn about his method.

A thick-set kindly man, Professor Shor received us very cordially and immediately carried us away with his ideas. At the museum he showed us rows of shelves on which stood deep china bowls with specimens of organs and tissues. They had been conserved by the method he had developed, in an aseptic medium.

“This method is simple, cheap and can be applied in any conditions,” Professor Shor told us enthusiastically. “You don't need any special media, receptacles or reagents, and at the same time specimens can be preserved for decades.”

We became acquainted with Shor's new method of autopsy and did our best to master it.

We returned from Leningrad enriched with knowledge which we were impatient to share with our comrades in the department. The first thing we intended to demonstrate was Shor's method of

autopsy. Soon I was asked to instruct final year students in this method.

At one of the demonstrations I had to come to the help of a student called Khoroshko who had run into difficulties as he was performing an autopsy on a man who had died of septic poisoning. We became so engrossed in our task that we did not notice that we had both cut our hands. Back home, I suddenly felt ill, developed a severe headache and went to bed. Then there was a telephone call from Khoroshko's mother. She asked me how I was feeling and said that her son was quite ill. I took my temperature—it was 39°C. A terrible thing had happened—we had both contracted sepsis!

We were placed in Professor Burdenko's clinic. Science did not then have any active means of fighting blood sepsis. The only method that was known was the use of large quantities of alcohol (a high concentration of alcohol in the blood helps neutralise the toxic products secreted by the microbes). Three times a day the nurse brought me a mug of diluted alcohol which I was supposed to down at one go. No wonder that after a dose of this "medicine" I became oblivious to the world. I remember hazily doctors who examined me, friends who came to visit me. My wife Klavdia Andreyevna, an internist, sat by my bedside day and night. So I spent several weeks in a state of constant intoxication. After a month, during which my temperature never dropped below 38°C, my condition improved and another three months later I was able to walk. Only then was I told that Khoroshko had died on the tenth day of his illness.

When I recovered I asked Professor Burdenko whether I was fit to continue work in the pathological anatomy department. He replied:

"After this illness you have either developed immunity to septic infections or else a heightened sensitivity. I do not advise you to try and find out which it is. Go and work in the operative surgery department for a while and then we shall see."

I was too weak after my severe illness, however, to start working at once.

### **A Team Without "Stars"**

It was 1933. I had to decide whether I was going to work at the surgical clinic or go on with my post-graduate studies in topographical anatomy and operative surgery, as Burdenko advised. I decided to follow my teacher's advice. This involved a lot of catching-up in a subject that was practically new for

me—topographical anatomy, a field of medical science which considers man's body from the point of view of surgical operations to be performed on it.

At the same time I worked in a hospital which served the builders of the Moskva-Volga Canal. In the morning I was usually on duty at the hospital and in the afternoon hurried over to the institute to perform experiments along the theme of my future thesis.

The topographical anatomy and operative surgery department was housed in the same building as the pathological anatomy department where I had started my post-graduate course. Workers in both departments were in constant contact and often arranged joint meetings and parties: so I did not feel an outsider. Soon I noticed the difference between the two departments vis-à-vis the level of research and the staff composition.

Most of the department's staff were young people who were not yet united by long years of joint work and, what is most important, by a common scientific endeavour. Each was free to choose his own theme and develop it as best he could. The professor's assistants, the department's scientific core, were overburdened with seminars and, besides, worked in surgical departments at various hospitals.

This system did not make for efficient research. Professor P. N. Obrosof, head of the department, was, like his assistants, overloaded with work outside the institute. He wore himself out trying not to be late for lectures, being in time for operations in out-of-town hospitals, making it to the polyclinic for consultations and, besides, finding time for social work.

He was so busy we only saw him on rare occasions. There was no supervision over post-graduates and it was wholly up to us whether we did any research or not. In such an atmosphere those who had no will and little initiative soon lost all taste for research, failed to prepare their thesis on time and went away to work as practical surgeons.

One of the best lecturers there was M. A. Bubnov. A persistent and strong-willed man, he found the time for teaching, research and practical work in a surgical department of a hospital.

Mikhail Alexandrovich Bubnov could present dull anatomical material so attractively that his listeners woke up to new fascinating features in topographical anatomy and operative surgery. During an autopsy, seeing a student lose his bearing in tissues, Bubnov would often take the pincers or scalpel and with one movement isolate the necessary blood vessel or nerve. He

seemed to be able to see through the human body. Subsequently he rightfully became a leading figure among the lecturers at the department's surgical clinic.

I became great friends with Mikhail Alexandrovich Bubnov and we started working together to determine the carbohydrate metabolism in novocain blockade, according to Vishnevsky. We experimented on cats, keeping almost a hundred of them in the cellar. Some were being prepared for the operation, others were getting well after one.

We had to experiment on cats because it was hard to obtain any other animals. It sometimes happened that residents of the neighbourhood resented the loss of their cat and came to have it out with us. We would then discontinue the experiment and return the animal to its irate owners.

Our experiments concluded, we decided to describe our observations in an article and send it to a journal. Our first research work was published in 1935 in the journal *Surgery* and reported at the department's conference.

The Karamyshen hospital, which served the builders of Moskva-Volga Canal, was situated in the Serebryany Bor district. The usual surgical cases were appendicitis, perforating ulcers, intestinal obstruction, acute cholecystitis and traumas.

The surgical department was headed by P. N. Obrosof and I was his assistant. There was always a lot of surgical work to do, operations were performed round the clock. This was a good opportunity to acquire the necessary skills and master the most varied surgical techniques, including the treatment of industrial traumas, fractures, dislocations, etc.

Gradually I developed the self-confidence and resolution that are so necessary in a surgeon.

In the hospital I collected material for my future thesis. The theme had been suggested by life itself. Construction workers, exposed as they were to the vagaries of the weather, often developed boils and carbuncles. Conservative treatment was not always effective and we had to open up the abscesses. But this did not always cause the abscess to heal quickly and, moreover, an ugly scar was left. For this reason many patients refused an operation.

Eventually we developed a sparing method of treating carbuncles, dispensing with the need to make an extensive opening in the abscess. Under the protection of a 2 per cent solution of novocain we injected an antiseptic solution (ammargen, rivanol and others) into the abscess. The small puncture in its centre enabled us to remove the pus. The inflammation subsided and the carbuncle



healed quickly. In some cases this treatment checked the development of the carbuncle midway, at its acute stage.

This method of treating pyoinflammatory foci became widely used, especially when antibiotics made their appearance. Today solutions of penicillin with novocain are often injected into carbuncles and furuncles.

Our experiment received approbation at the Surgical Society, and my comrade in Komsomol work V. A. Ivanov, a post-graduate at the surgical clinic, suggested introducing antiseptic solution into the arterial canal in order to fight pyoinflammatory processes. The idea seemed attractive and we started experimenting on dogs.

After a thorough study of the action of antiseptic solutions on the walls of the blood vessels and the surrounding tissues we decided that our method promised good results in the treatment of open wounds at the extremities complicated by suppurative infection. Subsequently V. A. Ivanov carried out a number of original experiments, and defended a thesis on this theme.

As for me, I went on with my research, conducted student seminars and operated at the hospital. I came home completely fagged out every day and did not have the energy to bother about my thesis. It was in this state that I responded to the summons of the institute's newly appointed director S. M. Khojamirov.



Academician N. N. Burdenko

"We have decided," he told me, "to consider yours and Glebova's theses at the session of the Academic Council dedicated to the twentieth anniversary of the Komsomol. I know that both of you are active Komsomols. The theses, so far as I can judge, are sound. I trust you will not fail me."

The director's words put new spirit into me. I began to prepare the defence.

Marusya Glebova and I had indeed been active Komsomols, and we were happy to defend our theses on YCL twentieth birthday.

Many people came to the anniversary meeting of the Academic Council on October 29, 1938. The former "Communards" turned out too. When I was given the floor I was in such a state of nerves I could hardly get any words out. But the official opponents spoke flatteringly of my work and my thesis was approved. Marusya Glebova also passed with flying colours. In the same year, 1938, soon after I had defended my thesis, Professor Burdenko offered me the post of assistant in his clinic.

## V. THE TEACHER AND THE PUPILS

*All through my life I saw real heroes only  
in people who loved their work and did it  
well.*

*Maxim Gorky*

### With Burdenko Again

I don't think there is a field of surgery in which the many-faceted talent of Nikolai Nilovich Burdenko has not left its imprint.

His scientific and social views had been shaped by Pirogov's, Sechenov's and Pavlov's progressive ideas. It was to them that he owed his deep interest in natural sciences, physiology and surgery.

In his *Autobiographical Notes* Burdenko remembers his absorption in physiology at the start of his scientific career. Ivan Petrovich Pavlov watched his progress and even offered Burdenko a post in his laboratory. But by then Nikolai Nilovich had already chosen his path and, flattering though the offer from the coryphaeus of physiology was, he remained true to surgery.

Still, he retained a love for physiology and experimental work to the end of his days. In those same *Notes* he recalls: "I was under

the spell of Pavlov's work, which underlay my philosophical thinking. In his research Pavlov always followed the motto: never invent or contrive but explore nature."

Before the First World War Burdenko went abroad several times, working at the best clinics in Germany and Switzerland, where he studied the intricate nervous system. Even then Burdenko was a worthy example of Russian medicine and was able to acquaint his foreign colleagues with our latest achievements in anatomy, physiology and surgery. In many areas of surgery Russia was on a par with the West, and in field surgery, for instance, had outstripped medical schools in the European countries.

Burdenko began teaching at the University in Yuriev (Tartu) after he defended his doctorate there in 1909. He headed the Department of Operative Surgery, teaching the students operation techniques and at the same time working at the University's surgical clinic. In spite of his youth (he was thirty-four) he was held in high regard by the University's students and teaching staff as a true innovator, keen researcher, thoughtful clinician and skilful surgeon.

During the First World War Burdenko worked as a surgeon in hospitals on the North-Western Front, performing the most difficult operations. He also did a lot to organise medical aid to the wounded.

The war brought Burdenko's great organisational abilities to the fore and largely determined his future in field surgery.

By the time of the Revolution Burdenko was already a mature scientist. Without a moment's doubt he sided with the Soviet Republic, whose ideals he was to serve faithfully to the end of his days. He took an active part in organising health protection in the young republic and in training its medical cadres.

Burdenko did an enormous lot to introduce the achievements of medical science into practical work. When he was Chairman of the Academic Council of the USSR Commissariat for Health he sought to ensure that medical scientists should not divorce themselves from practice, that practising physicians should be armed with the most effective methods and means of treatment. He himself set the example of how theoretical work was to be tied up with practical medicine, so that it would bring an improvement in diagnostics and treatment.

He was distinguished by an amazing versatility. The range of his research was so vast that it was at times hard to tell what he concentrated on at the moment: one day he would lose himself in the laboratory where they reproduced traumatic shock and evolved

methods of fighting it, and the next, he may be engrossed in blood transfusion or the treatment of purulent infestation of wounds. In all his manifold activities Burdenko was exacting towards himself, conscientious and incredibly hardworking. When studying surgical problems, he invariably took account of physiological, pathophysiological, biochemical and neuropathological data.

One of his greatest achievements was the organisation of neurosurgical aid in the country. On his initiative a big neurosurgical centre was set up in Moscow.

The problem of surgical treatment for diseases of the brain and the spinal cord had virtually remained unsolved until Burdenko came to grips with it. Not that he wasn't aware of the difficulties that confronted him. Suffice it to say that surgical intervention on the brain, especially its posterior parts, had been ending fatally in 75-80 per cent of all cases.

Nikolai Nilovich polished the techniques of brain operations to an incomparable finesse. A very important measure of his was to recruit specialists in very different fields of medicine to tackle this problem. As a result operational techniques were developed which ensured that the patients survived the most complicated operations and recovered, and improved methods of diagnosing diseases of the central nervous system were evolved.

Burdenko had a talent for detecting people's abilities and entrusting them with jobs they were best suited for. In the neurologist Akhundov, for example, he discovered a talented diagnostician who found his way blindfolded among the most baffling affections of the brain. Noticing the brilliant gift of a neurosurgeon in young Doctor Arutyunov, he began training him for this work. He valued A. F. Lepukaln not so much for his surgical mastery as for his abilities as an experimenter and his erudite knowledge. Burdenko's closest assistant Professor V. V. Lebedenko could stand in for him any day, both on the rostrum and at the operating table.

When I worked in Burdenko's clinic, he was a world-famous scientist, deputy to the Supreme Soviet of the USSR, Chairman of the Academic Council of the USSR Ministry of Health and was often given important social and state assignments. Yet his clinic always came first with him.

### **At an Operating Table**

Burdenko's clinic researched into many urgent surgical problems, in particular, the treatment of burns, gastric ulcers and

craniocerebral diseases. New antiseptic solutions were tested and so were sulfanilamide drugs for the treatment of wounds.

Burdenko set every one of his assistants a specific task. But research was never conducted on one's own. Each theme was elaborated by a team, consisting of doctors, laboratory assistants and students. The experimental part was done at the central research laboratory. The data obtained there were thoroughly analysed and compared with those obtained by other researchers. Only after a drug's reaction had been tested over and over again, were we permitted to use it in hospitals.

Before the war, patients came to Burdenko's clinic from all over the country. Many of them were very severe cases who had lost all hope of recovery. For them a course of treatment at Burdenko's clinic was their only hope.

Nikolai Nilovich operated a great deal, and for widely differing ailments. It would be an exaggeration to say that he performed all operations equally well—by that time surgery had already become rigidly differentiated, and no individual surgeon, however talented, could be equally proficient in all fields. But where Burdenko excelled over all others was in brain operations. Here he was beyond compare, an inspired artist who was not merely competent but possessed real virtuosity and elegance.

Brain and spine operations are among the most difficult. The surgeon has first to drill holes in the skull, then join them so as to cut out a bone patch the same size as the one in the skin. The bone patch opens outside like a window revealing the brain matter covered with a hard membrane resembling cellophane. Cutting through this outer membrane the surgeon finds himself facing brain tissue covered with a gossamer-like film consisting of innumerable blood vessels. He has to decide how to approach the tumour and remove it. The work involved is as fine as a jeweller's.

The tension in the operating room is extreme. We must watch the patient's blood pressure, his respiration, heart rhythm and other vital data. The surgeon must be constantly on the alert lest he cut some big blood vessel or injure a vitally important brain region in the vicinity of the tumour. The wound is constantly washed with a warm physiological solution, which stops the bleeding from the small vessels and makes it possible to see the tissues, both normal and affected. Several doctors assist the surgeon; they watch the function of the patient's separate systems and organs and inform the surgeon about their condition.

Step by step the surgeon penetrates the tender and sensitive tissue until he reaches the tumour threatening the patient's life.

Decades of hard and persistent effort have gone into making brain operations a routine matter. A lot of courage and daring were needed to prove that surgical treatment of severe brain and spine affections held promise.

The most difficult cases were usually tackled by Nikolai Nilovich himself. Sometimes he had to stand at the operating table for many hours at a stretch. Very seldom did he permit himself to sit down on a round revolving chair to rest a little and collect his thoughts or ask the opinion of other doctors. He usually concentrated utterly on the job in hand, spoke very little, sometimes tossing an abrupt sentence to the anaesthetist and stretching out his hand for instruments without a word. The nurse was supposed to know which instrument he needed. He resented mistakes and was apt to say the most cutting thing to the culprit.

"I can't imagine what this man can teach you, if he cannot even apply a ligature properly," he would say when cross to the students watching the operation.

But as soon as things righted themselves, he would calm down and say to the students:

"I was wrong to come down on my assistant like that. You can learn a lot from him."

Sometimes the assistant would parry the thrust. During one very difficult operation Burdenko vented his displeasure on his first assistant Vladimir Vladimirovich Lebedenko. "Who prepared the patient for the operation?" he inquired. "I," answered Lebedenko. After a pause Burdenko asked caustically, "Who the hell taught you surgery, I wonder?" In reply Vladimir Vladimirovich said calmly: "You, Nikolai Nilovich."

Burdenko grunted and concentrated on his work. The operation proceeded in utter silence and was successfully concluded. All of us pretended not to have noticed the exchange.

There were occasions, to be sure, that after a dressing down in the operating room an assistant declared he would leave there and then. But usually he calmed down after a while and changed his mind. We all set great store by working beside and together with Burdenko.

If Burdenko was strict with others, he was no less strict with himself. He never gave himself any peace until the diagnosis was conclusively established: he would drop into the ward several times a day, invite specialists for consultation and do everything in his power to elucidate the nature of the disease.

The clinic lived a very full and busy life. This was felt both by us assistants and even by the students who not only took part in the

operations but also helped to nurse post-operative patients and did night duty.

The well-known internist and member of the Academy of Medical Sciences of the USSR I. A. Kassirsky spoke with great warmth about the surgical clinic's work, after he had stayed there as a patient. "I was particularly impressed," he wrote, "with the night vigils of doctors and nurses. The whole world is asleep, I thought as I lay in my bed, but here in the semi-darkness and silence doctors and nurses quietly wage their relentless battle with death in the wards and the resuscitation department. A professor arrives to check up on a man he operated on in the morning. Injections are made, various systems are adjusted and switched on, life trickles into patients' blood vessels, calls are made in hushed voices to the dispensary.... Then an emergency occurs, a haemorrhage or a collapse. People begin running about—and after a period of feverish activity, silence sets in again in the corridors lighted by green-shaded lamps. The day is breaking, the slumber is so sweet towards morning, but the doctors continue their dramatic struggle. It will go on day and night, day and night.... The endless stream of days and nights—this is a doctor's life, a life given to the service of man."

During the night, decisions were taken about urgent operations by the assistant on duty, and it was he who performed the operations, with the help of interns and students.

When the assistant was unable to make the decision himself, he rang up Burdenko. Nikolai Nilovich insisted that we should not hesitate to ring him up any hour of the day or night and call him in for a consultation or an operation. If we failed to do so when the need was acute, he would scold us angrily. Burdenko put the patient's interests above everything else. He was prepared to forgive an omission caused by lack of experience, but those who were negligent and slothful were mercilessly sent packing.

I remember a certain post-graduate S. who worked in the clinic for a while. He was a gifted man but rather unorganised. Absorbed in his research, he was not attentive enough to the patients.

Once S. ran into our common room in great agitation.

"What's the matter?" we asked.

It appeared that Burdenko had met him in the corridor and cried out with a feeling unusual even in him: "If I see you loitering about once again I'll hate you!" Mark, not "kick you out" or "take measures", but "hate you". And what do you think? It had a dramatic effect.

At the same time Burdenko was aware that chastisement was not the most effective measure. A fine psychologist, he knew how to foster the necessary traits in doctors. I won't take it upon myself to list Burdenko's pedagogical methods. But the main point, to my mind, was his readiness to give a person a chance to find himself in independent work. Burdenko demanded a great deal from a young doctor, and also gave him a great deal, before entrusting him with a patient's life on the operating table. Nikolai Nilovich never hurried, for training a doctor is a lengthy process. In his clinic, moreover, this process was never simply the accumulation of knowledge and skills. The future surgeon was not allowed to remain a passive observer. The very atmosphere of the clinic drew him into the struggle for life. Beginning with little routine jobs and ending with direct participation in more and more complex operations performed by our chief—this was the path each of us trod.

"Try to do it yourself, by all means do! Don't forget the great maxim—from the simple to the complicated. But do not undertake to perform an operation independently until you feel sure that you can not only perform it but also nurse the patient through the post-operative period," Burdenko taught us.

What he strove to do can be called bringing out the best in people. Before becoming a pupil of his, one had to search his own heart and make sure that medicine was his one and only calling.

Nikolai Nilovich never divided the young doctors coming to work in his clinic into practitioners and theoreticians. He was of the opinion that a theoretician will not reveal his potentialities in full if he does no practical work. However, when he detected in his assistant a flair for analysis and generalisation, he did his best to encourage these propensities. I remember how quickly Burdenko "discerned" the theoretical talent in the then quite young V. Ugryumov. Today this scientist heads the Leningrad Institute of Neurosurgery.

Nikolai Nilovich came to the clinic practically every day and knew its entire staff, doctors and nurses, by sight. He considered it a doctor's duty to check every order and prescription, and he hit the ceiling when discovering that a doctor's order had been disregarded or some other form of neglect perpetrated. He had a habit of making unexpected visits to the clinic at night and the doctors and nurses on duty were in for it if Burdenko discovered they had been amiss in any of their responsibilities.

Funny incidents occurred, too. Once a nurse came running into the operating room saying that Nikolai Nilovich was storming upstairs demanding to see me. I had just finished an operation. It



was four o'clock in the morning. I washed, dressed and went up to the duty room. Nikolai Nilovich was pacing the floor like a caged tiger. Turning sharply at the creaking of the door, he asked me in exaggeratedly official tones what they called an establishment where the staff refused to admit its director. Feeling quite in the dark I tried to pacify him with some soothing generalities, but he persisted:

"No, tell me what establishment this is?"

"It's a clinic."

"No!" shouted Burdenko. "It's not a clinic, it's a whore-house!"

"Not a very happy comparison," I said defiantly.

"Why not?"

"Because those establishments lure people in, while here, as you say, they tried to keep you out."

The joke had its effect. Nikolai Nilovich simmered down and finally told me exactly what had happened. He had come to the clinic to pay another of his night calls, but the doorman blocked his way.

"You can't get in here, old man, not at night."

The doorman was new and did not know the clinic's director. Nikolai Nilovich told him who he was, but the doorman did not bat an eyelid.

"Burdenko is an important person, my man," he declared. "He'll be sleeping in his bed now, he has work to do tomorrow. Get off with you before I call the doctors."

After a long argument the infuriated Burdenko virtually broke his way into the clinic.

We laughed at the overzealous doorman and then Nikolai Nilovich told me: "Bring the keys to my office, please. I think I'll take a nap on the sofa there."

I brought the keys, unlocked the door of his office and froze in horror. On the sofa under a snow-white cover slept the intern G. Nearby stood his wet top-boots. And on Burdenko's desk, on three fat volumes of G.'s thesis, he had spread out his socks to dry under a lamp.

G. lived out of town and far from the station, and so he often spent the night at the clinic. The doctors on duty knew about his difficulties and would make a bed for him somewhere, most often in the x-ray room. But how had he got into Burdenko's office?

Seeing my dismay, Burdenko smiled, put a finger to his lips and tiptoed to the desk. He turned the socks over to dry the other side and just as softly left the room. He did not go home, but lay down on the bed in the common room. In the morning he sent for G. The man went into his office with trepidation. We awaited the outcome

of the conversation anxiously. Suddenly the door was flung open, G. dashed out, brandishing a sheet of paper, and ran down the stairs. Two hours later he came back radiant with joy and told us about his conversation with Burdenko.

"Nikolai Nilovich asked me all kinds of questions—where I had come from, whether I had a family and where I was living now. I told him that I lived far out of town and that travelling to the clinic took a long time. I told him that my wife had stayed behind in Orenburg Region at the district hospital where I used to work and that she has three children to take care of. Burdenko sympathised with my grass widower's position, but I told him I was so happy to get an internship at his clinic that I was prepared to stand anything. Then Nikolai Nilovich rang somebody up and asked him to help me get some living accommodation. I understood from the trend of the talk that they were prepared to cooperate and so he gave me a note and I rushed off to the Moscow Soviet!" Several days later G. jubilantly waved a warrant for a room; we were all happy for him.

When G. submitted his bulky thesis to Burdenko for approval, Nikolai Nilovich joked:

"I don't know how useful this work will be to science, but I know it's good for drying socks on."

Nikolai Nilovich got up early and, unless he decided to work at home, came to the clinic before the working day had begun. He would creep to his office unobtrusively and get down to work on some manuscript.

Burdenko was not a sentimental man, but he had great love and tenderness for children. His little patients always enjoyed special privileges. Nikolai Nilovich often visited their ward, talked to the children, tried to amuse them or asked the nurse to do something nice for them. The children were very fond of him. They were allowed to enter his office without knocking. And however busy the professor might be, he was sure to rise from his desk, pat the child on the head or take him up in his arms.

In his old age Burdenko became rather stout and walked slowly, with a waddle. A big, slightly asymmetrical head with a prominent forehead sat firmly on his broad shoulders. His features were crude, his nose fleshy, and his deep-set blue eyes twinkled slyly. He spoke with a slight nasal twang and laughed infectiously when he saw or heard something funny. When roused during an argument, he could be harsh, sometimes even rude. But he was always considerate with patients and amiable with people who came to him on business.

## Pupils and Followers

Many talented people, research workers and surgeons, worked in Burdenko's clinic before the war.

His deputy Professor Vladimir Vladimirovich Lebedenko—an energetic person, with expressive, slightly myopic blue eyes and an amazingly gentle smile—made people like him from the start. He knew how to smooth over the sharp angles of Burdenko's temper. He complemented Nikolai Nilovich, giving the clinic a cordial atmosphere and helping to pilot the ship, commanded by our more vociferous skipper.

A figure who stood out at the clinic was Vsevolod Erastovich Salishchev, an experienced surgeon and teacher and the author of a textbook on special surgery.

The son of the founder of clinical surgery in Siberia and the pupil of the brilliant surgeon I. K. Spizharny, Vsevolod Erastovich had imbibed the best traditions of Russian surgery, devotion to work, humanism and a protective attitude to patients.

Salishchev was considered to be one of Moscow's best specialists in operations on bile ducts, the gastrointestinal tract and the large and small intestines.

...There is a superstition current among the medical profession that surgeons should never operate on their close kin, even if asked to do so. It is not the question of fatality, of course, but rather of too protective an attitude to the patient which is apt to produce a reluctance for really drastic surgical action, and this, in difficult cases, may prove fatal.

Once Salishchev departed from this rule. A process of commissure formation had begun in his wife's abdomen. An operation was unavoidable, but the patient refused to have anybody but her husband operate on her. The operation proved to be extremely complicated, Salishchev was too overcome and carried it through with difficulty, and his wife died soon after.

Vsevolod Erastovich was broken up and swore never to operate again. But with time he got over his depression and resumed his work. Nor did the tragic incident mar his style.

There is hardly a surgeon who has not at some time or other made a fatal error at the operating table. It is not true that a surgeon develops a kind of immunity and is no longer affected by a patient's death on the operating table. But he must control himself and keep his wits about him even in the most critical situations, say, when a sudden haemorrhage floods the wound, an organ begins to disintegrate or some other anomaly occurs. The patient's

life depends on his self-possession, clear-headedness and resourcefulness.

Not so long ago the outcome of an operation depended wholly on the surgeon, and not on the operating team as today. Still, now, as formerly, the surgeon must possess sensitivity and courage, resolution and astuteness.

Salishchev was endowed with just these qualities. There were some, however, who thought him too "liberal". Once when an assistant started berating a young doctor in Vsevolod Erastovich's presence and told him he had better change his profession, Salishchev brought him up sharply. And when both participants in the incident went away, he told us the following story.

"I once heard a similar 'sentence', which nearly made me drop surgery. The assistant, who was supposed to supervise the operation I was performing, kept interfering with my work rather than helping me and in the end declared: 'You'll never make a decent surgeon.' A long time has passed since, but I haven't forgotten those cruel words. Words like these may break the man, kill his faith in himself, and this is the worst thing that can happen to a surgeon. That is why I make it a rule never to say anything of the kind to a doctor or a student, even when there is need. After all, the teachers may be mistaken in their prophecies."

In 1941 Salishchev was offered the chair at the faculty's surgical clinic. The offer originated with Burdenko himself, who had been made Chief Surgeon of the Red Army and no longer had the time to supervise the department's work.

### **"Give Anaesthetic!"**

In our clinic, as nearly everywhere else at that time, operations were performed under general ether anaesthetic or local anaesthetic by Vishnevsky's method (with novocain solution injected into the tissues).

Vishnevsky's method of local anaesthetic had been widely adopted. But in complicated and prolonged operations which involved extensive traumatising of organs, especially in the thoracic and abdominal cavities, preference was given to general anaesthetic.

Ether had displaced chloroform, being easier to tolerate, and, in its turn, gave place to more tolerable drugs. Ether anaesthetic was administered on the operating table through a mask. After taking several breaths of ether vapour, the patient fell into a deep sleep. All the anaesthetist had to do was add ether to the air in the mask

to keep the patient asleep. General anaesthetic has been constantly perfected ever since, new drugs developed, new apparatus designed, and a special field of medicine, anaesthesiology, has taken shape. But this did not occur until after the war, and before the war the graduation from ether to nitrous oxide was already a big step forward.

In some clinics, ours included, a quick-acting soporific was administered to patients intravenously while still in the ward. The patient was taken to the operating room already asleep. This method was particularly beneficent with people who were scared of the operation.

At that time we had no anaesthetist at the clinic, and ether was administered by the interns. This was how their career in surgery began—a young doctor had to learn to apply the ether mask faultlessly and to take care of the patient afterwards so as to preclude post-anaesthetic complications.

We had our own virtuoso anaesthetist, Ivan Vasilyevich Dyachkov. He was not too brilliant a surgeon, but so skilful an anaesthetist that the surgeon could rest quite easy on that score.

It was on very rare occasions that Burdenko dispensed with his services during an operation. Even when somebody else was applying the mask, Burdenko insisted that Dyachkov be present. The patients also had infinite faith in him and would ask to be put to sleep by “that tall doctor with a rasping voice”.

Ivan Vasilyevich Dyachkov was indeed inordinately tall and bony and had a rasping voice. He walked with long steps, swaying like a pendulum, and spoke with an emphasis on “o” like all natives of the Volga country. He was a very kind-hearted considerate person and was liked by all.

Living close by, Dyachkov would come the first to the clinic in the morning and leave, as often as not, the last. Before going he made a point of visiting all “his” severe cases.

He would see one patient, who would perhaps ask him shamefacedly whether he had really fought and swore when given anaesthetic, then he would go to the next, who had perhaps only been operated on that morning for perforated stomach ulcers. The patient would lie motionless, semi-conscious, his face pinched, dark circles under his eyes. A nurse would be sitting at his bedside.

Having felt his pulse and assured himself that everything was under control, Ivan Vasilyevich would walk out into the corridor. There an intern would be waiting for him: would Ivan Vasilyevich

take a look at the patient an ambulance had just brought in? Perhaps the young doctor would not be able to decide whether he needed an urgent operation or not. Dyachkov never refused a request like this.

And so it went on from day to day—rounds, operations, dressings, and seminars with students.

During an operation, seeing that an intern had difficulty with putting a patient to sleep, he would correct him mildly, telling the students present at the operation:

“Our colleague has lost sight of one important detail. In this kind of anaesthetic one mustn’t press the mask too tightly to the face, still less cover it with a towel. One must lift it from time to time to give access to the air. Otherwise a heightened concentration of carbon dioxide under the mask irritates the respiration centre and the patient can’t fall asleep.”

Ivan Vasilyevich showed how the mask must be applied and the patient fell asleep at once. The students gazed at him with admiration. For his part, he would ask one student to see whether the patient’s arms were comfortably positioned, show another how the lower jaw had to be held while the patient slept so that the tongue did not drop back and interfere with the breathing, how to remove the accumulating saliva, and such like. And all this without fuss, nervousness or unnecessary movements. The students learned many useful things from this experienced assistant.

He also loved telling them various funny incidents that had happened to him.

Late one evening the surgeon on duty was called to the admission room. A middle-aged man was sitting coatless on a chair holding a blood-soaked towel to his face. His wife, crying, told the doctor a sad story. For a whole month or so her husband had been coming home late, saying he had been kept at work. His wife decided to find out whether it was really so and discovered he was seeing another woman. When he came home she dashed at him in a burst of jealous fury and bit his nose off. When she saw blood gushing out of the wound she fainted. Her husband did not lose his head, picked up the tip of the nose his wife had spat out, put it behind his cheek, revived his wife and came to the clinic with her. Dyachkov (he was the surgeon on duty) washed the nose tip in a physiological solution and sewed it back into place. A week later the sutures were removed: the tip had grown back. Everybody was very happy, even the patient’s wife.

## Everybody Has a Gift of His Own

After a patient was wheeled out of the operating room, Nikolai Nilovich placed all his hopes on the doctor and the nurses in attendance. The outcome of an operation would largely depend on their skill and care.

There were several doctors in our clinic who were not particularly gifted in surgery or pedagogics but were irreplaceable in caring for post-operative patients, especially in the initial days, which are always the most difficult. Such doctors, or nurses, are attuned to the patient so sensitively that they are aware of every little change in his condition and are able to take the necessary measures in time like administering a heart medicine or an anti-inflammatory drug, giving a soporific, or a blood transfusion, etc. They watch the patient day and night helping him avoid the very dangerous post-operational complications.

My wards were situated at the end of a wide and well-lit corridor. Two were quite small, for two and three beds, and were intended for severe cases that had undergone resection of the stomach or the gall bladder. The third contained 25 beds and was dubbed by the patients "the railway station". This ward was for patients awaiting operation or those who had undergone comparatively light operations (hernia, appendicitis, varicose veins, etc.). Nobody minded being in so crowded a ward, because life here was quite lively and there were plenty of distractions.

One of our best nurses was Ksenia Ivanovna Churkina. She was not only experienced but also kind and generous. She would never leave the patient's bedside until the crisis passed and his life was out of danger. She never grudged sharing her knowledge with the younger nurses, helping them to obtain experience and confidence.

I remember a young woman coming to work in our clinic. Marusya had come from the countryside and had no special education or training. Nevertheless she announced right away that she wanted to work in the operating theatre. We explained to her that this takes a lot of learning and practical work. She was given an assistant nurse's job and was enrolled in a nurses' school. But she wouldn't give up her dream and wouldn't reconcile herself to a long wait. She often left her post, slipped into the operating theatre and there, from the doorway, watched the nurses, spell-bound.

Finally Burdenko came to hear about Marusya's passionate ambition. He called her into his office and talked to her for a long time. After that Marusya would spend hours learning to take apart and assemble the scissors, to use the needle-holder, the trephine

and the saw. Ksenia Ivanovna helped her and showed her things with her usual patience and good nature. They would ask young doctors to try Marusya out on an imitation operation. Both were overjoyed when a surgeon put Marusya at the instruments table during a real operation and when it was over praised her efficiency.

Soon Marusya was allowed to take part in an operation performed by Burdenko himself. She was so sure and nimble with the instruments that anybody looking at this snub-nosed quick-eyed girl would have thought her an experienced nurse. After that Nikolai Nilovich recruited Marusya's services for nearly every operation he performed. She made an excellent nurse.

There was a rule at the clinic that every assistant had to work as a ward doctor, in the polyclinic or at the experimental department for some three to six months. The choice rested with the person concerned. Since I had evinced a particular interest in purulent surgery I was made head of the purulent department for six months. This department was by rights considered the most difficult one. Most of its patients were in a chronic condition with wounds that would not heal, fistulas and trophic ulcers. Burn victims were also placed here. At that time we did not have antibiotics, such a powerful weapon of fighting infection, and so we tried dozens of drugs in an effort to relieve our patients. Rivanol was followed by ammargen, then by chloramine chloracid, etc. But each of these medicines affected the wound tissues more than it did the microbes, and so we soon discarded them.

Many patients had osteomyelitis, and their number would grow during 'flu epidemics. These patients would usually have a high temperature, a swollen extremity and a red spot in the place of the abscess. The only method of fighting this complication was an operation. Under general anaesthetic we would open up the abscess, clean away the pus, remove the necrotised tissues and fill the cavity with swabs impregnated with Vishnevsky's unguentum. We also blocked the nervous trunks of the extremity with a 0.5 per cent solution of novocain and placed it in splints. After that all that remained was to watch the patient and see whether the purulent process would heal or develop further.

If the patient was a child, there was every possibility that after the removal of part of the bone the remaining portion would be quickly regenerated, but in middle-aged people regeneration was very slow and relapses often occurred. In such cases more and more portions of the bone had to be removed.

We had no less difficulty in treating burns where we had to fight



the toxic effect, disturbances in the protein metabolism and restore the skin. All this taxes the patient's strength to the utmost and requires tremendous efforts from doctors and nurses. The treatment is in several stages. When the patient's condition improves, the surgeon removes with a razor a thin layer of healthy skin from another part of the patient's body and transplants it on the burnt area. Several operations are necessary until the entire area is "patched up". But the patient's recovery is enough reward for our efforts.

In this department I continued to treat purulent foci by the method I had developed earlier. Many of my patients were women suffering from mastitis. Previously an incision used to be made in the inflamed breast, often more than one. This left the breast disfigured. Using this new method we often managed to do without any incisions at all, confining ourselves to a puncture in the centre of the suppurative focus. The operation was quite painless, since we administered novocain together with the antiseptic solution. Several such injections, supplemented with physiotherapy, usually checked the inflammatory process. The women were extremely grateful, for the operation left almost no traces. We treated carbuncles and boils in the same fashion.

Patients with abscesses in the lungs were the greatest problem, especially if they had previously undergone unsuccessful treatment in the therapeutic department. These patients were usually very weak. To hope that the abscess would heal without any further treatment was futile. An urgent operation was generally needed before the process went too far. The operation was performed in two stages. First we made an incision in the soft tissues, removed a portion of the rib over the abscess and joined the membranes of the lungs and the thoracic wall to preclude the spreading of pus over the entire pleural cavity after we opened the abscess. The actual opening of the abscess was performed several days later, after we had convinced ourselves that the first operation was a success. As with severe burns, the post-operational care and treatment were of decisive importance.

Cases like these taught doctors and nurses to be collected, watchful and even self-sacrificing. Everything was of paramount importance, a timely dressing, high-calory diet, clean bed-clothes, fresh air, etc.

It is very difficult to foresee the course a suppurative process will take. Many factors affect it, including the location of the focus, the resistance of the organism and the virulence of the microbes.

I shall never forget the accident that befell a student called Emelyanov who was doing a course of practical studies at the

purulent department. I had warned the students that a furuncle on the face, especially on the upper lip, entailed serious danger to the patient's life. The purulent process is apt to involve the veins, with the subsequent formation of an infected thrombus in the lumen of the blood vessel. Since facial veins have no valves, the thrombus may break off and reach the brain with the blood flow or get into the greater circulation and cause general blood sepsis.

The students heard me out, asked several questions, helped with the dressings and went home. That very evening Emelyanov had a date with a girl. He was very annoyed to discover a pimple on his upper lip. Eager to make a good impression on the girl, he decided to extrude the pimple. When he came home that night his upper lip and the base of the nose were badly swollen and he ran a temperature. He decided to wait until the morning before consulting a doctor. But in the morning he was already too weak to get up. He had a bad headache, his lip was swollen and red. When he was brought to the clinic, we saw that his condition was critical. We operated on the infected vein and gave him the same treatment I had been given several years before for blood sepsis. But unlike me, Emelyanov did not pull through.

### **Before the Storm**

It was 1940 and Austria and Czechoslovakia had been occupied by Hitler Germany. With Germany's attack on Poland the Second World War was ushered in. The enemy had reached the borders of the USSR. Hostilities could be expected to break out any day.

Burdenko now spent less time at the clinic and was given more and more to do at the Chief Military Medical Board. When he did arrive, he would go straight to his office, walking heavily, taking his coat off as he went. After a short rest in his armchair, he would call the doctors in for a conference. He talked in a preoccupied, careworn manner. Explaining about recent international developments, he would impress on us that we had to be prepared for any kind of emergency. Once he was quite outspoken: "Please get down to work on instructions and regulations in field surgery. This is an urgent matter. In the event of war, we must have a unified medical system for the wounded, with strict continuity of treatment at different stages of evacuation."

Thus spoke an old medical officer, who had taken part in several wars, including the recent conflict with Finland, and we all became aware of the imminence of danger.

In fact, we had received a very specific assignment—to elaborate, within a short time, the principles of field surgical and

therapeutical work. We gave ourselves up completely to our tasks, taking our example from the doctors who had distinguished themselves during the recent military operations on the Karelian Isthmus.

Burdenko put on a fair show of sprightliness and vigour, but we could all see that his health had been seriously undermined by his enormous workload and responsibility. He suffered from frequent headaches and became hard of hearing.

1941 found us in a state of great preoccupation and anxiety. Under the influence of Nikolai Nilovich's talks, we were concentrating on teaching our students field surgery. We taught them to apply plaster casts and skeletal traction, to give blood transfusions and treat wounds. We asked the ambulance to bring us patients with open fractures and other traumas.

Professor Burdenko often came to the dressing room to show the students how to cut away the edges of dirtied wounds, how to distinguish which tissues, after surgical treatment, should be sewn together fast and which should not, and how to apply local anaesthetic.

I must say that the students tried hard, fulfilled all their assignments diligently and showed great interest in field surgery. They read the works of the great Russian surgeon Nikolai Pirogov and at our classes we analysed surgical work in past military conflicts. As far as I could judge, other clinical departments in our institute and Moscow's medical establishments were giving their work a very similar slant.

National conferences and congresses of surgeons also gave prominence to problems pertaining to military medicine. Back in 1932, at the Twenty-Second Congress of Surgeons the principal questions discussed were anaerobic infection, blood transfusions and traumatism. The Twenty-Third Congress in 1935 discussed shock and stage treatment of traumas. The Twenty-Fourth Congress in 1938 was devoted to the treatment of wounds, burns and frost-bite. The results of research in these problems were published in periodicals and were incorporated into textbooks; a number of monographs on field surgery were brought out. Both in published materials and in specialists' speeches, stress was laid on the importance of early operations on the wounded. The well-known field surgeon M. N. Akhutin, who had taken part in the fighting on Lake Khasan (as an Army Surgeon), addressed large gatherings of doctors, sharing with them his experience of organising the evacuation of wounded and impressing on them the importance of their being initially sorted into categories at

regimental level and the necessity of giving immediate aid to those suffering from acute haemorrhages and chest wounds.

Akhutin was the first field surgeon to treat an open pneumothorax by operative intervention. He summarised his experience in the monograph *Surgical Work at Lake Khasan* (1938).

Akhutin had covered himself with military glory at Lake Khasan. Marshal Zhukov wrote about him in his memoirs: "Once it was reported to me that Professor Akhutin, although in a state of extreme fatigue after the many operations and barely able to stand, had nonetheless ordered that they take his own blood for a transfusion to a wounded commander. I phoned him and advised that a younger doctor be asked to give his blood. Professor Akhutin said curtly that he had no time to hunt for the right blood group and, asking me not to detain him any longer, proceeded with the transfusion."

When speaking of the selfless work of doctors and nurses, who saved many lives, Marshal Zhukov praised Professor Akhutin's organisational abilities. "Professor Akhutin thought out and organised an excellent system of stage treatment for the wounded. He also greatly helped the medical personnel of the fraternal Mongolian army. He worked some 15-18 hours a day, and a large share of that time was given to training surgeons. I think I shall not be far wrong if I say that those who learned from Professor Akhutin went a long way in surgery."\*

Senior students and doctors flocked to Akhutin's lectures. I, too, learned a lot from them about field surgery and its tasks in war.

The medical world was vigorously preparing for the impending war. Everything had changed for the students, too—interests, pursuits, pastimes. A notice about enrolment to the courses for field nurses attracted crowds of applicants. We surgeons were forever being invited to factories to teach young people first aid.

Professor Burdenko never tired of instilling in medical workers, in clinics, at advanced training courses, at various sessions and conferences and through the press, the need to assimilate the fundamental organisational principles of the military medical service.

With the help of major specialists he issued instructions on urgent surgery for military and civilian surgeons. They contained all the tried and approved methods of primary surgical aid to the

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\*G. K. Zhukov, *Reminiscences and Reflections*, 1969, pp. 172, 173 (in Russian).

wounded and the principles of treating wounds in peace and war time. Soon his book *Instructions for the Treatment of the Wounded in Rear Hospitals* was published. In it he further developed the fundamental principles of field surgery. It was followed by *Directions in Field Surgery*.

"It is a great thing of course," said Nikolai Nilovich, "to write a book and publish it, but it is not everything. The main thing is to get the book to the practising doctor."

One could not but wonder at Professor Burdenko's persistence and energy, despite his failing health, in training doctors for their difficult job in the war. And it must be said that war did not catch us napping. We were well prepared to treat the wounded both in field hospitals and in the deep rear.

Field surgeons had been provided with recommendations, elaborated by major specialists, on fighting shock and haemorrhage and on anaesthetic and aseptic. They had at their disposal the simple and unfailing method of local anaesthetic developed by A. V. Vishnevsky. By the time the war started we already had a precise blood supply system, which made it possible to provide the wounded with preserved blood and blood substitutes.

# THROUGH THE WAR

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## I. THE BEGINNING OF THE WAR

*We shall defend that Russia, which freed herself, which ... accomplished her Soviet revolution through suffering and pain, we shall defend this Russia to our last drop of blood.*

*V. I. Lenin*

### Yershovo Field

On June 22, 1941, in the morning the radio broadcast the terrible news about the nazi attack. War! We had been expecting it, and yet it was a ghastly shock. The lives of millions of Soviet citizens changed abruptly. A vast human torrent gushed towards military recruitment offices, which worked round the clock channelling the people to various units and services.

In the very first days of the war most of the assistants, interns and nurses at our clinic were called up. Soon my category's turn came—fit for military service with reservations (I had had poliomyelitis in childhood and the after-effects of it made themselves felt throughout my life). In July 1941 I was sent to the clearing evacuation hospital in Yaroslavl.

The hospital was housed in several buildings on the bank of the Volga—today they contain the theoretical departments of the Yaroslavl Medical College. There was no time to take one's bearings and get used to a new place. July and August flew by amid endless work. It was a grim time, this first heart-breaking period of the war. Trainloads of wounded arrived one after another, and it was all we could do to wash them, provide with clean linen, change their bandages and send them into deeper rear.

Our hospital was a huge sanitary station, several dressing rooms and a comparatively small operating room for urgent cases. None

of us had any experience of work in such conditions and at first we never seemed to have a minute's rest. It was quite a job to find the right sized clothes for the wounded: greatcoat, tunic, breeches and boots. Worn out by the retreat and the setbacks at the front, the wounded were morose and irritable.

We only operated on those who had developed phlegmons on the way or had a haemorrhage. There could be no question of planned operations—the task of the hospital was to sort out the wounded, clean them up and send them further into the rear. Only then I understood the important role of the manageress, linen-nurse and the evacuating doctor.

One day Deputy Chief Surgeon of the Soviet Army V. S. Levit visited our hospital. He was surprised to see me working as an evacuating doctor and said:

“I think you would be of more use as a surgeon. The situation in Kazan is quite difficult. There are many hospitals there and most of the surgeons have gone to the front. When I return to Moscow I'll report about you to Burdenko.”

In September 1941 I came to Moscow to receive my official appointment to Kazan. The capital had changed beyond all recognition. Windows were criss-crossed with paper strips, there were sand-bags in the shop-windows, AA guns stood in the yards, and there were bombed-out buildings. One could feel war approaching the city.

Before leaving Moscow I dropped in on Burdenko. He was very busy and only said to me: “See you live up to the mark, my boy! You'll be kept pretty busy there. When you arrive in Kazan report to Alexander Vasilyevich (Vishnevsky), he is Head Surgeon of the evacuation hospitals.”

I went to the clinic to see my friends and find out about those who had gone to the front. Ksenia Churkina began complaining to me. She was in her late fifties and they refused to take her into the Army. I suggested that she come with me to Kazan. “Only get an appointment at the enlistment office,” I recommended. And she did just that.

We arrived in Kazan on a fine autumn day. The city was packed full with evacuated offices, hospitals and people. The city Party and Soviet organisations did their best to provide reasonably tolerable work conditions for the medical personnel. Many higher educational establishments and secondary schools were converted into hospitals. It was amazing that they should have succeeded in adapting quite unsuitable buildings as hospitals, fitting them out with operating rooms, dressing rooms, physiotherapy and X-ray

rooms, canteens, kitchens, laundries and other sanitary facilities.

Before the war civilian housing construction in Kazan was negligible and the old buildings had fallen into disrepair. The ever-increasing flow of evacuees strained the housing situation further. Often a family which lived in a small room accommodated two or three evacuees, sharing their crockery, bed-linen and even food with them.

I was appointed senior surgeon of an evacuating hospital housed in a veterinary surgeons school in Yershovo Field.

G. M. Nevrayev was head of the hospital and gave Ksenia Churkina and me a hearty welcome: severe cases were coming in daily and the hospital did not have its own senior surgeon. And one that brought a theatre nurse along was worth his weight in gold.

I was warned at once that besides working in my own hospital I would have to help young surgeons in the neighbouring ones. Indeed, before I could find out about my own wounded, urgent requests started arriving to operate on several severe cases in the hospitals I was to supervise. At that time it often happened that a hospital's senior surgeon did not have sufficient experience and only received the appointment because of the severe shortage of personnel. I had received a good practical grounding in almost every field of surgery.

As often as not, I had to operate every day of the week, including Sundays. As soon as I was through in one hospital, a drozhky would arrive to take me to another.

Soon the strain began to tell on me. Obviously something had to be done about it. A. V. Vishnevsky, who lived in the same house with me and saw me dashing from one operation to another, advised me not to try to do everything myself but to entrust more to doctors who were interested in doing surgery. This really was the only way out and I was grateful to Vishnevsky for this advice.

I lived in a small room in the hospital, next door to the hospital's operating theatre premises. Alexander Vasilyevich often dropped in to see me there. The hardships of an evacuee's life were wearing him out. He was advanced in years. Moreover, for several months he had had no news from his son Alexander, a Front Surgeon.

On long autumn evenings we would drink strong tea brewed by Ksenia Ivanovna, our ministering angel, and talk about the war, the setbacks at the fronts and about the best way of treating infected wounds.

How often had the wounds to be dressed? This was a very difficult question to answer. I thought then that the more often the bandages were changed, the sooner the wound would heal.



Gradually Alexander Vasilyevich convinced me of the opposite.

"You must take account of the nervous factor," he argued, "and this means disturbing the wound as little as possible. The bandages only have to be changed when there is an acute infectious process. In all other cases the wound must be left in peace under the protection of an ointment dressing for five or six days. The ointment relieves irritation in the wound, is a strong antiseptic and absorbs the discharge."

I had many occasions in the future to feel grateful for this and other valuable advice from Vishnevsky's vast store of knowledge and experience.

I have never known a professor so democratic in his ways and so kind-hearted as Alexander Vasilyevich Vishnevsky. He was not only an outstanding scientist and innovator, he was a true doctor of the people.

### **A Doctor of the People**

While working in Burdenko's clinic I had little occasion to meet Vishnevsky and suspected that his popularity was somewhat exaggerated. But when I got to know him personally, when he explained his Ivan Pavlov and Nikolai Vvedensky-based system of treating wounds and inflammatory processes to me and when I had a chance to see the results of his method myself, I came to appreciate its full value. His system had emerged from serious and extensive research and had been tested, before the war, on thousands of patients.

Vishnevsky had a keen and penetrating mind and an ability to concentrate his attention and will on some outstanding medical problem. Everything about him was large-scale and impressive—his thoughts, his studies and his practical activities.

Vishnevsky's most momentous contribution to medicine was his method of giving local anaesthetic. I heard that he began searching for a reliable method after three patients had died following an operation performed under general anaesthetic. Their deaths were not the result of the operation but of the toxic action of chloroform. I must say that such occurrences were not infrequent at that time.

Vishnevsky was greatly helped in his task by the discovery of novocain. As well as using this drug in operations he also developed various methods of influencing the nervous system with novocain blocks, obtaining a striking therapeutic result in severe pathological processes. When still quite young, Vishnevsky had become an excellent surgeon who boasted the lowest per cent of



Professor A. V. Vishnevsky

fatalities and post-operational complications. This was because of his new anaesthetic method. Vishnevsky urged the maximum sparing of tissues in an operation. His anaesthetic method caused a change in the very techniques of operations. They became more protective towards the organism, and, what is most important, more anatomical.

The principal merit of his method is its simplicity and accessibility. "My method is such," he wrote, "that it can be applied at any given moment in any part of our vast country. It can be used to save a patient's life in the sparkling operating theatre of a big centre and on a simple wooden

table by the light of a paraffin lamp."

Vishnevsky's local anaesthetic method for operations and for treating inflammatory processes had become firmly established and made it possible to cope with the huge numbers of wounded during the Great Patriotic War.

But Vishnevsky's views and methods did not prevail without a protracted and stubborn struggle. He was criticised for multiple injections and the big volume of solution injected. The prominent German surgeon Hans Finsterer, for instance, who performed an original operation on the stomach, considered that the big volume of novocain solution used by Vishnevsky in abdominal anaesthetic was dangerous for weak patients.

Vishnevsky patiently explained the safety of his method and its advantages compared with other methods. This is what he said about multiple injections: "The most important thing is that each injection in the abdominal cavity is made on the edge of the infiltration already produced by the previous injection. With this

we run no risk of damaging a blood vessel and causing a haematoma....”

The debates around Vishnevsky's method dragged on for years, until life itself exonerated it.

In those hard initial months of the war, when many patients arrived with severe complications, A. V. Vishnevsky often worked beside me to show how the wounds were to be treated. He could do wonders with a badly infected purulent wound which could often otherwise be fatal,

He operated with the precision of a jeweller: the cuts he made were always exactly in position and never a millimetre longer than absolutely necessary. He could “read” the pathological process like an open book. His method of novocain block of nerve trunks and plexuses had a speedy effect on the inflammatory process, sometimes checking it before it had a chance to develop. The unguentum that bore his name acted as a mild “stimulus” on the tissues, mobilising the organism's defences to fight the infection. The novocain block of the cervical nerves in severe thoracic wounds worked like a miracle — the patient who had been tormented with excruciating pain revived before our very eyes, hardly daring to believe that the pain was gone. The method had a truly staggering effect.

During the war, the cervical-nerves block enabled the surgeon to perform complicated operations on the chest and abdominal organs and helped to save thousands of lives.

One day I was to perform such an operation. The evening before Alexander Vasilyevich discussed the operation with me. He asked me whether we had a sufficient stock of the unguentum and gauze and promised to come and watch me at work.

Indeed, he came to the hospital early in the morning. All the “walking” patients rushed out to see the famous professor. Vishnevsky walked unhurriedly, with the heavy tread of a big man long past his prime. He asked one man a question, reproached another for a soiled bandage, all in a kindly voice, with a gentle smile.

I was very proud to have this famous surgeon in my hospital and talking to me like an elder friend. I asked him some more questions that had occurred to me during the night, and, then, unfortunately, he had to leave. He was anxiously awaited in several other hospitals.

I started the operation. After giving local anaesthetic, I removed two small bits of rib. Then I cut a “window” into the pleural cavity, cleaned the pus and incised the loose deposits of the pleura. I dried

the cavity thoroughly, cleaned it with an alcohol-soaked swab and began filling it with gauze swabs impregnated with Vishnevsky's unguentum. First I dabbed the swabs into the deeper recesses of the cavity, then moved up, closer to the mediastinum. I did everything as Alexander Vasilyevich had taught me, without leaving a single centimetre of the pleura uncovered by the ointment. The ends of the swabs faced out, filling the incision in the thorax and leaving no space for pus to accumulate. With his wound treated like this, the patient ought to be up in about two or three days.

Operations on purulent pleurisies with unguentum-soaked swabs proved very effective. The very appearance of the wards containing the patients with thoracic wounds complicated with pneumothorax changed drastically. The number of septic complications was sharply reduced. The wounded were improving quickly and eventually returned to duty.

October 1941. A cold rain was pouring down outside. The damp air penetrated the corridors, the wards and the operating room. It was cold. The wounded put on all their warm things. The mood was bleak. The radio brought heart-breaking news: "After bitter fighting ... under the pressure of superior forces ... our troops have retreated from...."

A new train-load of wounded arrived, most of them with bullet fractures of hip bones. Their legs were bound in plaster casts. The feverish glitter in their eyes, their high temperature and parched lips indicated that an acute inflammatory process was developing under the plaster casts. Cases like this were sent to the dressing room straightaway.

On the table lay a young sergeant with a pinched face. He complained of pains in his leg. I removed the plaster cast and there came the fetid smell of rotting tissue. The leg shone as though polished and in places resembled marble. The skin gave off a characteristic crackling sound when touched. There was a small shrapnel wound in the middle of the hip. Above it there was a line across the leg, separating its healthy part from the affected one. There could be no doubt he had gas gangrene.

From textbooks I knew that gas gangrene was the worst complication in bullet and splinter wounds. These patients had to be treated in a special operating room and kept in a separate ward. Linen, instruments and even medical personnel should also be separate. This rule was established in Pirogov's time; he was the first to realise that gas gangrene has a strong tendency to spread to other patients.

It was later established that gas gangrene spores are very resistant and are not killed with ordinary sterilisation methods. That is why special precautions are necessary.

I began the operation. After administering raush-anaesthetic, I made wide cuts along the sides of the leg, reached the bone across the muscle layers and removed the necrotised tissues. Then I put swabs impregnated with Vishnevsky's unguentum into the wounds and put the leg into Cramer's splints. The patient was given a blood transfusion, serum injection and cardiac drugs. We vacated a separate ward for him and gave him a separate nurse, though it involved a lot of inconvenience.

After finishing with the other wounded I hastened to Vishnevsky. I told him about the new party of wounded and described the sergeant's condition and my treatment in detail. The professor pricked up his ears and asked me how I intended keeping track of its development. I felt that temperature, pulse and general condition would be clear enough indication, but Vishnevsky thought this would not be decisive and advised me:

"Go back to the hospital, Vladimir, and tie an ordinary silk thread above the wound. If you find that tomorrow the thread has sunk in, that will mean an edema is developing. Then you'll have to make more cuts to diminish the edema and help aerate the wound."

I returned to the hospital, put on a special smock and entered the sergeant's ward. His face was sweaty and pale and his pulse fast. The leg looked much the same as before. I cautiously placed a silk thread above the wound and left it so it could be seen, warning the nurse to inform me straightaway if it sank in.

In the night I felt somebody shaking me. It took a tremendous effort to open my eyes, I was so fagged out. It was Ksenia Ivanovna, who looked extremely worried. I had to go to the dressing room. The gangrenous patient was there already. He was semi-conscious, had a high fever, his lips and tongue were dry, and his pulse fast. The silk thread had sunk deep into the skin. So the deadly edema was creeping up.

Again I gave him raush-anaesthetic. I made more cuts, overlapping the healthy area, put in more unguentum-impregnated swabs and put the leg back into a splint.

At the base of the hip I left a small strip of skin open, tied a thread again and administered a lumbar block.

The operation over, I went back to my room but could not fall asleep again. I opened a book of Yesenin's poems, which stood on my shelf beside books on surgery and traumatology. There was no

point on consulting the latter, for they gave advice on the treatment of appendicitis, gastric ulcers and gall stones, but not on the treatment of wounds in wartime. It occurred to me that over the last few months I had not encountered one peacetime disease. It looks as though war exerts an enormous influence on man's psyche, drawing his attention away from internal disorders and towards external. I decided to ask Alexander Vasilyevich what he thought about this phenomenon.

I fell asleep towards morning and was not wakened for the rounds—the departments' head doctors decided to give me a chance to rest.

There were three departments in our hospital, each taking up a floor. The head of the first department was an old pediatrician Yakhontova. She was not used to grown-up patients and used to blush when examining them. I could hardly refrain from smiling when she reported: "The patient is suffering from pains in his tummy." She had much difficulty in writing the epises—short summaries of the course of the illness. But she worked selflessly, and never left her department until all the patients had been attended to.

The two other departments were headed by young energetic doctors who had only recently graduated from the Kazan medical school. Both were very hard-working, and I had begun entrusting them with minor operations, such as removing shrapnel from soft tissues and opening phlegmons and abscesses. They had also learned to apply plaster casts to extremities. I could now leave my hospital to operate elsewhere with an easier mind. In other hospitals the doctors were learning fast too.

Antonina Ivanovna Lapina, the senior surgeon in one of the hospitals I supervised, could already remove mine shrapnel from soft tissues, amputate and resect ribs, open up purulent cavities in bones and was very good at applying plaster casts. Mark you, she had had no intention of specialising in surgery. But war changed many people's plans.

I liked going to that hospital. It was run very efficiently. Antonina Ivanovna had rather a sharp manner. I would hear her loud voice the moment I entered the hospital. When she made her rounds a lot of people got a dressing down—nurses, orderlies and patients. But nobody took offence, knowing her kindness and devotion to duty.

This hospital was headed by another woman, a veteran member of the Party B. Y. Sverzhinskaya. Before the war she had worked at the People's Commissariat for Health, in the methodical

department for secondary medical education, and I had known her in this capacity. A hospital head's day is packed with problems: one day something goes wrong with the heating system, then the water is cut off, then medicines or provisions run short. So she would go hunting for plumbers or to procure fuel and foodstuffs "by hook or by crook". In the autumn of 1941 running a hospital was a tough job indeed.

When an operation was over, a bottle of cherry liqueur, pickled cucumbers and cabbage and lovely *pelmeni* would be served us in the common room. We would eat this fabulous food and rest, discussing hospital affairs and remembering mutual friends who had gone to the war.

Antonina Ivanovna mentioned more than once her desire to have more surgical work and less "fighting with the personnel". She even made me promise that I'll take her along if I go to the front.

There is hardly need to say how avidly we seized any morsel of news from the fronts. Every town ceded to the enemy wrung the heart. Our wounded were a source of information. We did not even have to ask them: their very appearance, the way they had been given first aid spoke for itself. These people had obviously been through hell, had known the bitterness of retreat and loss of comrades.

The German troops had penetrated deep into the Soviet Union. Leningrad was in the grip of a blockade, Kiev had been taken and so had been Rostov-on-Don. Bloody battles were raging on the approaches to Moscow.

The nazis were making frantic efforts to seize the capital. It was besieged by Hitler's crack troops, air armadas and panzer divisions transferred from Western Europe and Africa. It was a hard, inhumanly hard time for the Soviet people. On November 23 the nazis captured Klin. A day later they reached Solnechnogorsk. We learned these sad facts from the radio, but in those days nobody knew as yet about the legendary feats of valour performed by thousands of Soviet soldiers who stood unflinchingly between the nazi troops and Moscow.

But in early December it became clear that Operation Typhoon, the code name the nazis had given to their drive on Moscow, had fallen through. German troops had been bled white, and the advance halted.

The Soviet Command had in the meantime prepared a crushing counter-offensive. In early December 1941, Hitler's troops were smashed and thrown several hundreds of kilometres back. They were not going to parade in the streets of Moscow.

This defeat was a shattering blow to nazi Germany's entire war machine and marked a turn in the fortunes of war. The Blitzkrieg had failed ignominiously, the myth of the German army's invincibility had been exploded. Our descendants will never forget the soldiers' feat, the heroic labour of the entire Soviet population and the Party's vast organisational work which made victory possible.

The Germans' defeat at Moscow also brought a fundamental psychological change. We became immediately aware of it from the mood of the soldiers. The wounded who arrived at the hospital after the counter-offensive had begun were a very different crowd. Forgetting their severe wounds, they'd tell us excitedly how they had liberated villages and towns and how the Germans had fled leaving behind machines and equipment.

There were lively conversations in the wards until well past lights out. The nurses found it hard to chase their patients into beds. Often I would come into a ward in exasperation intending to establish order but I couldn't help staying for an hour listening in fascination. There were some really good talkers among the wounded.

"The Fritzes used to be so sleek and smart and now they look like hungry lice," a blond young chap told his listeners lustily.

An older man remembered how he escorted a group of prisoners into the rear:

"You should've seen what they were wearing! Women's kerchiefs on their heads and straw boots on wooden soles—it's a laugh, brothers, it really is a laugh."

And never a word about themselves. One would think that these people, who had not left the trenches for weeks on end, who had gone into attack under heavy fire and shielded their comrades with their bodies, had no idea of their own bravery.

We did our best to ease their sufferings and give their nerves a chance to relax before sending them back to the fighting. And how impatient they were to get back! No sooner had their wounds healed a little than they started pestering us to discharge them, accusing us of bureaucratism and many other sins.

A tankman whose arm had been sliced off at the shoulder by a shell fragment was waxing angry about the "helplessness of medicine".

"I asked the doctors at the field hospital to sew the arm back and they told me nobody has as yet made such an operation. So what, says I, nobody has, but after you do it, others will follow. And how am I going to fight without an arm, let me ask you?"





At a first-echelon surgical hospital. V. K o v a n o v and  
A. L a p i n a performing an operation

He intended to fight, if you please, when he was barely alive. He had lost a lot of blood, his features were pinched, he could hardly walk and spent most of the time lying. We gave him a blood transfusion, glucose and a physiological solution.

One night I went to the theatre—for the first time since the war had begun. During the performance I was called out. An ambulance was waiting for me in the street. Several minutes later I was at the hospital. My tankman was lying in a pool of blood on the table in the operating room. Ksenia Ivanovna was pressing down the bleeding vessels in the stump. She was ready to collapse, having stood in this position, straining with all her might, for more than an hour.

The purulent process in the soft tissues had eaten away the walls of the blood vessels and caused a strong haemorrhage. If the nurse had been a few minutes later, the patient would have died.

I started suturing the blood vessels above the haemorrhage site. The operation was successful. When the tankman was discharged from hospital and received an artificial arm, he said: "So many

people have become cripples like me. See you learn to sew arms back in place soon. Mine might have grown back, too.”

These words, so poignant and hopeful, left a deep imprint in my memory.

One frosty day in January a tall man in flyer’s helmet, fur jacket and fur boots came into the hospital. He introduced himself, opened his field bag and gave me a letter from my brother.

I had not heard from Alexei for a long time and was overjoyed to get a letter. Alexei wrote about his work at an aircraft factory. He was in A. N. Tupolev’s group of designers. The pilot told me my brother was greatly respected at the factory.

Work absorbed Alexei so much that he forgot to write about himself, how he lived and how his health was. He only mentioned in passing that he had a persistent cough. “I must have caught a cold,” he wrote.

But it was not a cold. Later I found out that my brother had T. B. This disease drove him into an untimely grave. He did not live to see Victory.

In 1942 life in the hospital became better regulated. The wounded were now coming in according to a schedule, which gave me time to do plastic operations for damaged blood vessels and nerves or disfiguring scars as well as treat fractures and remove shell fragments and broken bits of bone. With the scars, the task was simpler when I only had to isolate the nerve from the scar tissue, and much more difficult when there was a defect along the length of the nerve.

I would like to go into the cases like the tankman’s in greater detail. The wounded who had injuries to major joints (hip or knee joint) or with amputated extremities, stayed the longest in our hospital. Amputations left a depressing feeling of inadequacy, but we had to perform them in hopeless cases when the wound was in a severe septic condition which could only be checked by a crippling operation.

It was hard to talk to a patient who had had an arm or a leg amputated. He would demand that an artificial limb be made available at once because he wanted to return home on his own two feet or with both arms. It was impossible to convince them that an artificial limb could not be used until at least six months after the operation. Not even when a specialist from the nearby artificial limb factory said the same did it have any effect. So we had to supply the patient with two prostheses, one for temporary use immediately after discharge from the hospital, and the other for constant use after six months had passed, when the

stump had "ripened" and the edema of soft tissues had disappeared.

"Training" the stump for an artificial limb was an extremely painful process. Even a mere touch caused unbearable pain at first. We had to persuade the patient to try and bear pain, otherwise the stump would never toughen enough to support his weight. Once the point had been driven home, the patient would start training his stump to bear pressure—first against a pillow, then against the mattress, then against a felt mat and only towards the end of training against some hard surface. So, step by step, his teeth clenched, a man would prepare himself for standing "on his own two feet". It was a joyful event for patient and doctor when the former at last had trained himself to walk.

Sometimes a patient, after the first unsuccessful attempt, would lose heart and refuse to train his stump. You could talk your head off, arguing, but he'd just lie there in glum silence, his back turned towards you. Then I would tell him about the heroic surgeons V. V. Uspensky and N. A. Bogoraz, who had both lost their legs and found the strength and the will to learn not only to walk but to operate standing on artificial limbs.

To get ahead of my story, I will say that after the war when I worked in the Health Department of the Central Committee of the Party, a group of military surgeons of which I was a member, put forward a proposal for the manufacture of special cars for invalids who had lost both legs. The proposal was approved and many invalids were, as a result, able to return to active life and work.

### **Our Patrons**

Our hospital was under the patronage of the Academy of Sciences of the USSR. Academicians and members of their families helped us a great deal.

The hospital suffered from a shortage of nurses, most younger women worked in the war factories and those nurses we did receive were older people often not physically fit enough for the heavy duties of a ward nurse.

The wives of research workers at the Academy's institutes which had been evacuated to Kazan agreed to take care of the severe cases. They worked out a schedule for day and night watches. Our voluntary helpers had a hard time of it. They had to go without sleep, miss meals and learn many new and arduous tasks. Anna

Alexeyevna Kapitsa brought her teenage sons with her. They rolled up bandages, gave the wounded water and tea, and helped them to eat their meals.

The wounded had a great affection for a tiny gray-haired old woman, the wife of Academician Trachtenberg. She often brought home-cooked meals for the severely wounded who could not eat the ordinary hospital food. She would sit and look on delightedly as the patient tucked into her tasty dish.

We all knew that Academician Pantryagin's family had a hard time of it, for the mathematician was blind and needed care himself. Yet his wife would not agree to be relieved of ward duty and worked there the same as all the others.

Academician L. A. Orbeli's daughter, Maria, who worked at the Physics Institute, often came to the hospital after work. Kind, jolly and extremely sociable, she cheered everybody up. She became friendly with Ksenia Ivanovna and the latter often said to her: "What a pity you are not a nurse, Maria dear. You are wasting a real talent."

Academician Orbeli, feeling lonesome without his only daughter, would come to the hospital too. Naturally enough, we used his visits to our advantage—to ask his advice, to consult him about a tricky operation, such as the isolation of the sciatic nerve from scar tissue, and the like.

Orbeli found the time to discuss the most severe cases of injuries to nerve trunks and would tactfully advise about the best method of treatment, invariably adding: "Unfortunately, I am not a doctor, I cannot advise treatment. But we can put our heads together to try and devise a way to restore the conductivity of nerve trunks."

A favourite pupil of Pavlov's, Leon Abgarovich Orbeli was an outstanding scientist in his own right. His works in physiology were widely known and earned him recognition both in the academic world and among practising physicians. Orbeli promoted several original trends in physiology and made a great contribution to the elaboration of many important problems. He was among the founders of a new branch in physiology—evolutional physiology. His works on the physiology of the vegetative nervous system and the physiology of sensory organs were of great theoretical and practical interest.

While in Kazan, Academician Orbeli, on top of his considerable organisational work at the Academy, gave much of his attention to research and work in hospitals. He collaborated with practising surgeons in seeking a solution to urgent problems like removing

pain, and restoring nerve conductivity and vital functions of the organism.

Academician E. V. Tarle, an eminent historian, regularly gave talks to the wounded. Tarle was a splendid speaker and his vivid lectures were listened to with breathless attention. Telling about the developments at the fronts, he would draw comparisons with the Patriotic War against Napoleon in 1812. He painted a colourful picture of the retreat of Napoleon's armies from Moscow, and would then, with the insight of a strategist, analyse the rout of Hitler's armies near Moscow. Tarle's talks had a beneficial effect on the wounded. Afterwards, they would spend a long time discussing his arguments and examples.

Workers at the Academy of Sciences did more than help with the economic tasks involved in running the hospital, checking medical apparatus and caring for the wounded. They also helped with political and educational work. Here the Academy's Party Committee played the leading role. Though swamped in their own work, the Committee members found time to drop in at the hospital to see our commissar about the most suitable time for arranging lectures and talks.

The Hospital Commissar Major A. V. Borisov spent all his time with the wounded. Only recently discharged from a hospital, he refused to go home on convalescence leave and demanded to be given a posting right away. So he was made a hospital commissar. Leaning on a stick, he would make the rounds, staying a long time with those who had had a particularly bad time of it. I was never present at his chats, but could always tell by the mood of a patient if the commissar had been boosting his morale before a serious operation. When I thanked him for this, he would wave his hand and say that he had had nothing to do with it.

Our commissar left us when he was well enough to return to his unit. We were extremely sorry to see this wonderfully warm-hearted man go, but there was nothing for it—war is a time of partings.

Before long, my fortunes changed too. I was summoned to the regional mobilisation department and asked whether I would agree to work as a surgeon at the front. Of course, I agreed at once.

On a warm day in the autumn of 1942 I left Kazan together with Ksenia Ivanovna Churkina and Antonina Ivanovna Lapina. Our destination was Moscow where the hospitals for the 5th Shock Army were then being formed.

## II. AT STALINGRAD

*Our country is a cradle of heroes, a fiery crucible where simple souls are smelted and forged to be as strong as diamond and steel.*

*A. N. Tolstoy*

### Baptism by Fire

At the district's military medical department the duty officer accepted our documents and passed them on to E. B. Meve, chief of the field evacuation centre (FEC). I had heard about him before the war when he had worked at a tuberculosis polyclinic. He had been in the army from the beginning of the war but had only assumed his duties as chief of the FEC a short time before. So far he had been in charge of three hospitals, and neither of them had had a senior surgeon, so our chief was delighted to get two surgeons and an experienced theatre nurse to boot.

"We would like to work at the same hospital," I told him at once. "Ksenia Ivanovna is my right hand, and Doctor Lapina is not quite ready to work independently yet."

Meve fingered his beard thoughtfully, then wiped his pince-nez and replied, screwing up his myopic eyes:

"All right, I don't mind. Then we'll make your hospital the basic one. You will teach young surgeons and nurses to work in the field. Especially since you have mastered debridement."

We were naturally overjoyed. Meanwhile the chief continued:

"Before going to your army you'll have to work for a while near Rzhev, where military operations are now in progress. A qualified surgeon is indispensable in field hospitals. This will also give you a chance to see how well our hospitals are prepared for the serious work which awaits us."

On the same day we were introduced to the staff of our hospital. All the doctors were women, all were internists, and not one had had any experience in surgical work. The nurses were just out of school. It was clear that, as before, Ksenia Ivanovna would be my mainstay.

Doctor Alferova was just a slip of a girl. She had completed four years at medical college and was issued with a wartime doctor's

diploma. She had a round ruddy face and was the incarnation of health. Her large eyes looked trusting and inquiring at the same time: she was awaiting "the real thing" impatiently.

The other two doctors, M. G. Lokshina and M.S. Rodina, comported themselves with severe restraint. They had been called up at the beginning of the war, had been in encirclement and had had a taste of front-line life.

Rodina would joke at Lena Alferova's expense: "See you don't oversleep the reveille, doctor. Mother is not here to wake you up."

Lena did not get offended. Instead she asked, obviously not for the first time: "Is it true we shall have to give medical aid under shelling?" The other two doctors smiled indulgently.

Early in the morning lorries arrived which were to transport our equipment. We loaded crates of instruments and bed-linen, operating tables, an autoclave, stretchers and a stock of provisions.

Our hospital's head, Major of the Medical Corps Vladimir Krylov, was also very young—just turned 21. He had recently graduated from the Military Medical Academy and was smartly turned out with calfskin boots, a snugly fitting greatcoat and a cap worn at a jaunty angle. He dashed about from lorry to lorry issuing instructions.

Loading over, the personnel of all three hospitals were lined up. We were waiting for someone from the Military District Command to arrive. We all wore army greatcoats, tightly belted in the correct military fashion. At last a medical staff car appeared on the road. We stood to attention. The car stopped some twenty metres away and a district representative climbed out unhurriedly. Meve made his report concluding with the words: "Lieutenant-Colonel of the Medical Corps Me-ve reporting." The district representative saluted and introduced himself: "A-be." A titter ran along the line. The district representative looked puzzled, but then got it and laughed too. The combination of funny sounding names was indeed comical.

At last the command was given to board the lorries. We climbed in, each platoon to a lorry, and off we rolled along the Volokolamsk Highway.

A fine autumn drizzle had started up. Anti-tank ditches, barbed wire, infantry trenches were on both sides of the road. Some had crumbled down and were filled with water—obviously nobody expected to use them again.

Many of the villages consisted of nothing but charred ruins with chimneys sticking up desolately. Not a soul was to be seen.

Suddenly somebody shouted, "Look! A nazi cemetery!" Indeed, row upon row of identical wooden crosses stood in perfect order. On some hung rusty helmets.

It was here that Hitler had mustered his forces for the final onslaught on Moscow. These warriors of his had never reached Moscow. Nor had their mates who remained alive. But the enemy had recovered from the shock of our counter-offensive, had stopped retreating and was resisting frenziedly, trying to halt the Soviet troops' advance. The sound of artillery was becoming more and more distinct.

We pitched tents in a wood some fifteen kilometres from the front-line and made ready to receive the wounded. They were not long in arriving. The divisional medical aid station could not keep up with them and some were brought to us straight from the firing line.

I thanked my stars for having seasoned front-line doctors like Rodina and Lokshina on my staff. They were perfectly calm and reliable, while Lena Alferova kept starting at the explosions of the long-range artillery shells. She looked apprehensive and Lokshina had to reassure her over and over again:

"There's nothing to be afraid of, dear, this is random fire, just pay no attention to it."

The clearing tent was crammed with the wounded. The severe cases were lying on stretchers placed on trestles, while the lightly wounded pressed closer to the iron stove. Doctor Lokshina examined each perfunctorily and sent some to the sanitation unit, others to the dressing station, still others to the operating room.

Five operating tables stood in a large tent. Doctor Rodina worked on two, excising the wounds and applying plaster casts. The other three were mine. Lena Alferova was assisting me, gradually learning surgical skills.

On the first day we received some 300 wounded. Most had shrapnel wounds, but there were some with bullet wounds too. As a rule, the lightly wounded asked us not to send them back into the rear, but to let them go back to the front-line medical station or, at worst, allow them to stay with us. Those who had wounds in the thorax or abdominal cavity or open fractures of the extremities were in no state to ask anything at all. They just lay on the stretchers motionlessly, since every movement caused unbearable pain.

Those with chest wounds suffered the most. Besides pain, they were tormented by coughing, often with blood, and had difficulty in breathing. If the bandage slipped, one could hear air being sucked into the pleural cavity through the wound. They kept



tossing about because every position seemed to be more uncomfortable than the other.

These cases were my main concern.

Before starting on an operation, I applied a vagosympathetic block, as Alexander Vasilyevich Vishnevsky had taught me in Kazan. I asked the doctors who were free at the time to watch me do it.

The block would bring instant relief, the patient's breathing would become regular and the pain ease off. Novocain injected in the cervical nerve trunks interrupted pain impulses coming from the injured pleura.

While Lena Alferova prepared the next patient for an operation, swabbing the area around the wound with alcohol and iodine, placing towels all around it and covering the patient with a sheet, I would examine the wounded on the other two tables. I had entrusted Rodina with applying the vagosympathetic block, which she had learned to do faultlessly.

After giving local anaesthetic, I would excise the shreds of muscle in the wound, remove bits of ribs, widen the wound and clean blood clots from the pleural cavity. Then I would remove the shrapnel from the lung tissue and stop the bleeding. It was hard to believe that a tiny fragment the size of the little finger nail could work such havoc—tearing the muscles, breaking the ribs, and wounding the lung tissue. If the wound was superficial and no serious injury had been done to the lung, I would then suture the muscles of the chest, leaving only the surface wound open.

Antonina Ivanovna Lapina came into the operating tent after a short breather. Back in Kazan she had applied the cervical nerve block many times, and was quite proficient at it. But now she was to perform her first independent operation on an open pneumothorax, and I could see she was terribly nervous. Still, she took hold of herself. Her movements were unhurried and precise. Whatever had happened to her volubility? She just dropped curt commands to the theatre nurse: "Scalpel! Scissors! Clamps! Napkins!"

She kept asking her patient how he felt. Each time the wounded answered in a low voice: "OK, doctor."

He had no idea how that reply gave the surgeon added confidence. At last the operation was over and the patient was taken away. Now Antonina Ivanovna could relax a little. She talked and talked about how the operation had proceeded and we all listened sympathetically, well understanding how she felt. At last she calmed down and proceeded to treat other, less complex cases.

The weather was cold and wet. We heated the tents with iron stoves. It was the task of the lightly wounded to keep us in firewood, which, thank God, was plentiful in the forest. They also helped our wearied nurses to tend the severe cases.

Our tents stood at the edge of the wood. The leaves had fallen off the trees, and the hospital was easily seen from the air. A controller from the divisional headquarters pointed this out to us and we did our best to camouflage the tents with fir branches. It wasn't a very good camouflage, but, luckily, the hard-pressed Germans could not bother with hospitals and we were never bombed.

We worked almost without rest for three days and nights. Then we decided to take turns, lest we just drop down from fatigue.

Krylov, the hospital head, had ordered hot tea and sandwiches to be brought to the operating theatre. While some surgeons rested, others went on with the operations. I had my breathers when Rodina and Lapina were on duty. Krylov was very solicitous after my well-being and would not let them wake me up unless there was a really pressing emergency. I lived in the same tent as he, and we had become good friends. He had matured, as people do at the front. He fussed less and was not so ready with instructions and orders. He was no longer the dandy we had seen on the day of our departure for the front. He had abandoned his calfskin boots for ordinary soldier's ones, and instead of his smart greatcoat went about in a quilted jacket.

His duties were numerous, but every day he found the time to drop into the clearing tent to check whether all the wounded had been washed and given a hot meal. A wounded officer would refuse to hand in his revolver, and our hospital head would settle the "conflict". Another would refuse to be sent into the rear, and Krylov would explain to him that the doctor's word was law with us.

Evacuating the wounded is the most onerous and responsible task for a hospital head. We did not have enough ambulances and had to send the wounded into the rear in passing lorries. The procedure was as follows. The senior lieutenant, in charge of the hospital's administrative unit, would stand at the crossroads, stopping lorries going into the rear and trying to persuade the drivers to take some wounded men along. Some agreed at once, others refused point-blank pleading an urgent assignment. Often the hospital commissar would join the lieutenant to reinforce his arguments. Nevertheless, the wounded were evacuated one after another.

Four or five days later a lull set in on our sector of the front. Only the badly wounded who could not stand transportation remained. All the personnel who could be spared were told to rest. The hospital head, the commissar and I decided to use the lull to discuss some of our affairs. The thing that worried us most was the delay in evacuating the wounded from the regimental medical stations. The commissar had already sent a report to this effect to the divisional political department. They promised to take the necessary measures. Presently, however, the order arrived from Meve to pack up and return to Moscow, leaving our wounded in the care of the hospital that would take our place.

The packing was done in two hours and we were on our way back to Moscow, where a train was being formed that would take three hospitals to the 5th Shock Army.

Thus ended our participation in the offensive near Rzhev in the late autumn of 1942.

### **The Kamyshin "University"**

Towards evening our train, carrying our equipment, arrived at Kamyshin, some 200 kilometres from Stalingrad.

In the late summer of 1942 Hitler's armies had broken into Stalingrad and were making frantic efforts to push the city's defenders into the Volga, planning to turn northwards afterwards and march on Moscow.

But the savage attacks by General von Paulus' crack troops had been foiled. Hitler's huge war machine ground to a halt, its spearhead blocked by a tiny piece of land on the right bank of the Volga where Stalingrad's defenders were fighting to the death. Fierce fighting had been going on in the ruins of the city for several months now. Every house and every step cost the Hitlerites tremendous losses. And on November 19, massive fire that descended on the enemy positions announced the beginning of the Soviet offensive. Towards the end of 1942 the 6th and 4th Panzer armies were encircled. The noose was drawn ever tighter around the enemy's throat. Our 5th Shock Army, commanded by Lieutenant-General V. D. Tsvetayev, was given the task of preventing the encircled enemy grouping from breaking out and also repulsing Fieldmarshal Manstein's troops who were hastening to their rescue.

Our hospitals were housed in Kamyshin's schools, clubs and cinemas. Until active operations began, we were in reserve. Our hospital group were mostly young people who had no experience of medical work in the field. Most of the surgeons were recent medical

school graduates. They had but a vague idea about how a wound has to be treated, a plaster cast applied to open fractures, open pneumothoraxes sewn up and abdominal organs operated on. We had to teach them all this in the little time we had.

Thus the Kamyshin "university" came into being. Every free hour was used to study textbooks on field surgery and anatomical atlases, as well as instructions and regulations on rendering surgical aid to the wounded. The young doctors asked us veterans to give them several lessons in topographical anatomy and field surgery. The gymnasium in one of the schools was turned into an autopsy room. Each doctor was given the chance to perform typical operations on organs and tissues. I should say the main difference between our "university" and an ordinary medical college was that there were no laggards.

From early morning until late at night, the young doctors mastered the techniques of amputations, removal of ribs, opening up the trachea and other operations. We elaborated a unified surgical system and staged treatment in accordance with the instruction of the Chief Surgeon of the Soviet Army N. N. Burdenko. We also examined specialised aid to the wounded, like neurosurgical operations in head wounds, etc.

Army Surgeon V. A. Rusanov warned us that specialists—neurosurgeons, ophthalmologists, maxillofacial surgeons, neuropathologists, etc., would be included in the staff of every big hospital. The task of general surgeons was to give proficient aid to those wounded in the chest, abdomen and the extremities. So at our lessons every doctor tried his hand at these operations, from the debridement of wounds in soft tissues, to complex operations on the abdomen, chest and pelvis.

The most difficult surgery, wounds in the abdominal cavity, required training on dogs. We used experimental animals to perform resections of ribs, opening the trachea, and suturing up an open pneumothorax. It was very important to teach young surgeons to establish the condition of abdominal organs, to remove injured parts of intestines and perform intestinal sutures. Our chief issued us with plaster and bandages to train the doctors and nurses to apply plaster casts. A. I. Lapina taught the young doctor and nurses to apply plaster casts to wounded extremities.

Ksenia Ivanovna Churkina undertook to train the nurses. She gave them so much to do they had no free time left at all. But we had to learn fast if we were to fulfill our task. I was amazed at Ksenia Ivanovna's gift of presenting the most complex problems of man's physiology and pathology in a simple and lucid manner. She

would use instances from her practical work to support every statement. And she kept stressing that surgery often has to be done in extremely difficult conditions.

She concentrated on teaching the nurses to assist the surgeons during an operation, and also dress wounds and apply splints. She also taught the young nurses to make blood transfusions, give intravenous injections, and anaesthetic, and change the bed-linen under the severely wounded. Having received such a broad practical grounding, the nurses could work in any department, from the evacuation section to the dressing and operating rooms.

In other circumstances there might have been complaints about the overcrowded schedule, but these girls were prepared to study even at the expense of their meals and sleep. And their perseverance paid good dividends when real front-line work began.

Two girls proved particularly bright. They were Nina Plakhova and Anya Samoletova. Nina was a very young girl, with pigtails, a gentle pink-cheeked face and long eyelashes shading her dark eyes. She had a manly stride, wore her uniform elegantly and was annoyed that her luxurious hair did not fit under the forage cap. Anya Samoletova had come to the army from an orphanage.

Both girls lodged with Ksenia Ivanovna and came to understand her so well there was almost no need for words. Ksenia Ivanovna trained them so that they became first-class theatre nurses.

Anya became attached to Ksenia Ivanovna as though she were her mother. Ksenia Ivanovna, for her part, gave her all the unspent warmth of her lonely heart. This did not prevent her, however, from being as demanding



Head theatre nurse Ksenia Ivanovna  
Churkina

with her, even more so, as with the others. Anya took it in the right spirit. After the war Churkina adopted Anya Samoletova, helped her to obtain a higher education and find her path in life.

Our “university” revealed everyone’s potentialities. For instance, I had very grave doubts about the nurse Tamara Dikina. She looked so frail and helpless. But I was wrong. During the advance, when the wounded filled the hospital to bursting point, she would work in the operating room for twenty-four hours at a stretch, and, moreover, found the time to visit the wards where the severe cases were put after their operation. On many an occasion I had to order her to go and rest, and yet she’d come back under one pretext or another and would not leave until she was convinced everything was under control.

At the “university” we discovered that Tamara had a beautiful voice. But she was reluctant to take part in amateur performances. We learned the reason much later—she was afraid that talent-hunters might pick her out and take her into the army song and dance ensemble, while her dream was to become a doctor.

At about the same time we found out that doctor Rodina was a skilful accordion player. She had been the leader of an amateur musicians’ group at a large Moscow factory.

The hospital commissar, A. F. Komarov, gave us a lot of help in organising and running the “university”.

The commissar was a middle-aged man, but looked very smart in his well-fitting greatcoat and shoulder belt especially with his Mauser pistol at his side, which was the object of many a joke. Later, when the commissar was back in a rifle unit, an enemy bullet struck the wooden holster and smashed it to smithereens without so much as scratching Komarov.

The commissar was short and thick-set with a big square head and a near-sighted squint under his steel-rimmed glasses. He spoke with a slow drawl, supporting his words by decisive gestures of his hand. He did not like to interfere with the running of the hospital and refused to act for the hospital head, even when the latter was absent. He saw his mission in conducting friendly confidential chats with the wounded and the hospital staff, especially with those who were feeling low. He would sit beside such a man and, before the man knew where he was, he was confiding all his troubles to the commissar. Yes, our commissar was a great one at reassuring people, encouraging them, and planting the seeds of hope in their hearts.

General Tsvetayev, who commanded the 5th Army, approved of our studies and even thanked the Medical Department head for the

excellent organisation of practical training in preparation for the coming military operations.

Our experience of training doctors and nurses was handed down to a group of hospitals situated nearby under surgeon N. I. Kozlov.

Time passed quickly, we were issued winter uniforms—sheepskin coats, fur caps and felt boots. It was very cold, with strong winds and blizzards. The roads were constantly snowed under, and we often had to clear the way for lorry convoys moving towards Stalingrad.

We could feel that decisive events were approaching. Soon we were told to finish our training sessions and prepare to move at any time. The hospital head and commissar were summoned to one conference after another, and after each they would call us all together to pass down the latest instructions. The situation demanded maximum preparedness.

Even going to bed we would continue to discuss the best way of preparing the hospitals for moving positions, who to assign to the advance group and who to leave behind with the main base.

But a week passed, then another. The whole world heard and read admiringly about the Soviet victory at Stalingrad. And at such a time we were standing idle! Everybody was on tenterhooks. The wildest rumours were circulating. Our chief Meve did not dare show himself, knowing he would be showered with questions he could not answer. There was nothing for it but wait for our marching orders.

At last the 5th Army entered combat. Heavy fighting ensued and we followed in its tracks. The roads were littered with smashed German materiel and there were many enemy corpses lying about in all postures. The hospital would linger near a village retaken from the enemy to attend to the wounded and then move onwards.

We passed Kalach. Its streets were a mass of smoking ruins. We were now seeing war in all its horror at close quarters. Still, we were advancing and the enemy retreating; that gave us strength and cheer and nobody complained of hardships.

The nazis were resisting stubbornly, clutching at every hamlet and every fold in the terrain. The artillery bombardment never ceased. The air was thick with the roar of engines, the blasts of explosions and the rattle of machine-gun and rifle fire.

A heavy artillery barrage and massive bombing of enemy positions would be followed by yet another infantry thrust forward. We followed in its wake, deploying our hospital in villages taken from the enemy.

No sooner had our lorries braked by the schoolhouse at the big railway junction at Tormosin, than the medical station which had been housed there moved on again passing its wounded to us practically on the go. On top of that, a cavalry corps that was about to start a deep raid in the enemy rear left its own wounded in our care. We found ourselves with some two thousand wounded on our hands, who needed to be quartered in the houses, fed and rendered urgent surgical aid. All this with only five doctors, twelve nurses, eight orderlies and some lightly wounded soldiers who were helping the latter. I was at my wits' end. Lapina and Rodina began operating, with Lena Alferova helping them. Some 200 people were waiting at the clearing station where Doctor Lokshina was in charge. There were many more chest and abdominal wounds than we could hope to cope with. To say nothing about a queue of lightly wounded at the dressing station. We had to set up an additional operating room for the lightly wounded. This task was entrusted to Doctor Rodina. Lapina was doing extremities, and I the serious cases.

Fortunately Army Surgeon V. A. Rusanov came to our hospital towards evening and he helped me get through the heavy chest and abdomen cases. We went without sleep for two days and nights, supporting ourselves on strong tea. Sometimes I managed to slip out of the operating room for a few minutes to see how things were in the wards. Here the nurses were making blood transfusions, injecting physiological solution, removing sputum from the pleural cavity, changing the bandages, in short, waging the post-operational battle for life.

Patients with open fractures of the extremities wore heavy plaster casts and were often quite helpless. The lightly wounded gave them cigarettes, drinks of water, and helped them with the bed-pan.

At last the terrible rush was over and some sort of order was established.

Now I had the time to draw some conclusions. Why, I asked myself, had there been, even if not for long, confusion and a lack of organisation? Hadn't we trained our personnel well enough? Obviously, our mistake had been to omit preparing them for great influxes of wounded. The decisive thing here was fast clearing, separating the light and serious cases into two streams and setting up special dressing stations for the former.

We had assumed that our hospital could receive and treat up to 200 wounded a day. If pressed, we could cope with 300 or even 400.



But when two thousand descended on us, we were swamped. Nor did we get any help from above. They could have sent a reserve hospital to Tormosin or at least given us some more personnel. This was an oversight. At the front, making the most rational use of the available medical strength is very important. Actually, as the war proceeded, methods of manoeuvring the medical support during major military operations were elaborated. I will discuss these in greater detail later.

Weather was very unstable in February 1943. Sometimes there would be a blizzard with piercing winds, sometimes it would be sunny and serene. There had been a heavy snowfall in January, but the snow had settled and the well-worn roads shone glassily. The fighting had moved far ahead and now raged around Shakhty.

One morning a jeep stopped in front of the schoolhouse. Out climbed two high-ranking medical officers. One was tall and lean, the other plump, short-legged and very unmilitary-looking—his uniform was baggy and the belt had slipped down on his belly. These were Head of the Front Medical Directorate N. P. Ustinov and Chief Surgeon of the Front Professor G. M. Gurevich. I made my report and went on to tell them about what we were doing to speed up medical aid and evacuation of the wounded. I showed the visitors around the hospital. They questioned me about the clearing system, and asked to see the operation and dressing sections and the evacuation department.

As we were walking along the corridor, we met a group of wounded men emerging from the shower room. And what do I see—one is carrying Cramer's splint across his shoulder and another holding a Diedrichs' splint under his arm. The latter is usually applied in fractures of the hip bone, but the owner of the splint was walking on his two feet, just limping a little. I stared in dismay.

The two eminent visitors broke into hilarious laughter.

"Hey, senior surgeon, this is the first time I see a patient walking about with a Diedrichs' splint under his arm! However did you manage it?"

I felt extremely foolish. Obviously, the doctors in the advance medical aid station had, to be on the safe side, applied a Diedrichs' splint to a man with a light leg wound. What an utterly ridiculous sight it made!

Entertaining though the episode might have been, it showed that all was not well with clearing the wounded in our hospital and I decided to pay special attention to it.

After inspecting the hospitals, the medical chiefs left, promising to help with evacuating and transferring those wounded who needed a lengthy course of treatment in the front's hospital.

In parting, the Head of the Front Medical Directorate commended our work: "Well done! You organised things well even though you had a hard time of it."

Of course, I was pleased to hear the praise, but I wondered what they would have said had they come on an inspection tour two or three days earlier. Well, God seemed to be on our side.

In conclusion Ustinov said: "As for the shortcomings, I'm sure you are aware of them without my telling you and will do your best to eliminate them. Good luck to you, Army Surgeon."

I was amazed to hear myself addressed so and said I was only the hospital's senior surgeon.

"Well, then you *will* be Army Surgeon," Ustinov replied with a smile.

Our hospital head Krylov was greatly put out by this piece of news, which meant I would be leaving the hospital soon. But I reassured him—surely they could not deprive the hospital of its senior surgeon at such a tense time.

Soon a medical convoy arrived and most of our heavily wounded were taken away. Only those who could not stand transportation remained behind, among them two gangrene cases—one wounded in the shin and the other in the shoulder.

I treated both in the same way as the sergeant in Kazan. The two men were placed in an anaerobic ward. A special dressing room was fitted out nearby and the best nurses were stationed to watch them. Both men were in a critical condition, both complained of distending pains in the wounds and both ran a very high temperature.

After extensive incision, a blood transfusion and antigangrenous serum, as well as a lumbar novocain block, the man with the shin wound began to improve quickly. But the man with the shoulder wound suddenly developed an extension of the gangrenous process to the chest and the back. I had to make incisions there, too. He was operated on two or three times a day and altogether was subjected to 13 operations!

Our stubborn struggle resulted in victory—we saved the man and his arm, too. Although little muscle tissue remained intact in the region of the shoulder, the arm retained its mobility in full.

Once again I was grateful to A. V. Vishnevsky. It is a great art, the treatment of purulent processes, and the surgeon feels immensely gratified when he succeeds in saving the life of a man

who has developed gas gangrene and returns him to the ranks.

At last the long-awaited front hospital which had remained near Kamyshin all this time, waiting to be transported, arrived. We passed our non-transportable patients to it—about 40 men altogether. If only it had occurred to the medical administration to send at least an advance group from that hospital to our aid when we were having such difficulties with the great influx of wounded!

We packed our belongings and started for our new location near Shakhty. There we were awaited impatiently, for the divisional medical station was urgently needed at the front.

The wounded began to arrive before we were properly settled. Most of them were men from that very cavalry corps who, a couple of weeks before, had galloped past our hospital in Tormosin on their way to the enemy rear. Many of those brave cavalymen fell during the raid.

The wounded were brought in sledges, wrapped in sheepskin coats. Their bandages were soaked through and smelled vilely—obviously they had not been changed for a long time. We lifted the men off the sledges and carried them on stretchers to the clearing section. There they were given hot tea, those who could be washed were given a bath and then sent on to dressing rooms and operating theatres.

Again the doctors and the nurses stood at operating tables for three days at a stretch. The courage and patience of the wounded were truly amazing. They never so much as groaned or cried out during the most painful operations. Only their eyes shone feverishly and they gritted their teeth.

On one of those nights I was summoned to the tent where a young surgeon who had recently joined us, Galya Dmitriyeva, had been operating on the lightly wounded. I found her lying on a couch and moaning. I examined her—it was acute appendicitis.

It was three o'clock in the morning. As luck would have it, our generator chose that very moment to break down. I could not postpone the operation till the morning—the purulent appendix might have ruptured and then we would have had a peritonitis case on our hands. So we lit up paraffin lamps made of cartridge cases. The lighting was far from adequate, but what can one do! I talked Galya into agreeing to an immediate operation, wondering all the while whether she realised that I would be operating on her almost blindly.

Lena gave her ether anaesthetic. Churkina and Lapina assisted me. When I opened up her abdomen and saw the condition of the appendix, huge and ready to burst at any moment, I realised that

we were not a moment too soon. Carefully, like an engineer handling a mine, I freed the inflamed appendix from loose commissures, ligated the mesentery of the appendix and clamped it at the base. Now I had to cut it through between the ligature and the clamp. At this crucial moment, the lamp started spluttering. They brought another one and it was not any better. It took them some time to light up the wound properly and all the time we were on tenterhooks—the volatile ether vapours might have caught fire, or soot from the lamp could have got into the wound.

When the operation was at last over, everybody heaved a sigh of relief. Galya's friends carried her into a ward next door to the operating room. To everybody's joy she got well quickly and returned to work. Whenever we meet these days, we recall that operation by the oil-lamp.

By late March 1943, the end of the winter campaign, the military situation had changed radically in favour of the Soviet Army. All along the vast front-line stretching from the Black Sea to the Barents Sea the enemy was being pushed westwards and sustaining enormous losses. In our southern sector the front passed along the line Lisichansk-Taganrog. Spring came early that year. In March the roads had already become impassable. More than 300 severe cases had accumulated at our hospital. All ambulances trying to reach us got stuck. We became practically marooned, cut off from both provisions and front hospitals. We sent out alarm signals with mounted messengers to the rear, but no help was forthcoming.

We were not so badly off for bandages and medicines, but the food situation was critical. The local population had nothing to share with us—the nazis had swept their larders clean. My heart contracted as I looked at severe cases. We might have made a good job on his wound, the post-operational treatment might be all that could be desired, but malnutrition deprived the man of strength to overcome the infection. Then one day I remembered that people in the North who often starve in bad winters keep their strength up with fresh deer blood. What if we tried that, I wondered. We still had several bullocks.

So we took several glassfuls of blood from a live bullock and offered some to a man who was in a grave condition. The very sight and smell of it nauseated him. We then added some spices to it and a few grammes of alcohol. That was a very different proposition. The wounded man drank the "cocktail" with relish.

Very soon the other wounded men heard about the "cocktail"

and started asking for this "medicine". The results passed our expectations. Their mood improved, and so did the condition of their wounds which lost their gray film and jelly-like edging.

However, I soon said goodbye to my hospital. I was appointed Army Surgeon to the neighbouring 44th Army.

### Army Surgeon

Were I now asked to describe the duties and responsibilities of an Army Surgeon in a nutshell, I would say: the Army Surgeon is the chief specialist for surgical aid and treatment for the wounded at all stages, beginning with the battalion medical aid post and ending with specialised army hospitals. He organises all surgical work in his army, determines the extent of surgical aid given at every stage of the evacuation and provides for the continuity of treatment. He supervises the work of the surgeons under his command, summarises their experience and corrects their mistakes. Together with the head of the Army's Medical Department, the Army Surgeon must foresee probable losses before a military operation is launched and provide the sectors likely to bear the heaviest losses with adequate medical support, drawing on special medical companies or reserve hospitals.



1944. In the forests of Byelorussia.... Carting a wounded man from the battlefield with the help of a dog team..

At the height of combat, the Army Surgeon visits medical stations and field hospitals, helps to operate on the wounded and teaches the surgeons how to give surgical aid in the most complicated and severe cases. He gives most of his time to guiding front-line medical stations and hospitals. In other words, he has his hands pretty full.

I knew nothing of this when I assumed my new duties, and there was nobody to explain to me what they were. Fortunately, I arrived in the 44th Army when no active hostilities were in progress.

It was a hot summer. The Soviet troops bore down on Taganrog in which the Germans were "bottled up". The front-line at the 44th Army sector passed along the Mius river and partly along a deep ravine some 18 to 20 kilometres from the town. Behind stretched endless steppes with rare islands of surviving adobe huts in which the rear units, including hospitals, were housed.

During the day it was impossible to reach the front-line medical stations, for an enemy double fuselage scout plane (nicknamed by the soldiers "window-frame") constantly hovered above, firing at every moving thing or giving a signal to German batteries.

Life began after sunset when convoys of ammunition, fuel and provisions set off for the front-line. The lorries drove without lights, practically feeling their way ahead. It is hard to understand how a convoy could travel in utter darkness without mishap. Only now and again a torch would flash for a split second and then all would be pitch-dark again. It was a heroic feat, no less, to take supplies to the front-line units.

The temporary lull in military operations gave me a chance to visit the army's main medical units, especially its advance medical stations. These were mostly housed in large dugouts in the slopes of the ravines. Only at very close quarters could you make out a slit-trench leading into the depth of the slope. Following it, you reached an underground hall with rows of plank-beds, the clearing section. In the underground halls nearby they had operating theatres and dressing rooms. There were also wards for the serious cases.

I must note at this point that underground medical stations and even hospitals were the only answer to the problem of bringing qualified medical aid as close as possible to the trenches and at the same time providing maximum safety for the wounded and the medical personnel. Therefore underground hospitals were extensively used in the army, although the earthwork took a lot of

time and effort and we all had to pitch in, from orderlies and convalescent soldiers to the surgeons themselves.

We prepared intensively for the oncoming advance operations. The experience accumulated in the 5th Army stood me in good stead here. If at the beginning of the war medical units attached to the field forces were only expected to bandage the wounded and send them on into the rear, now the second-echelon medical establishments received wounded who had already been operated on. Practice had shown that this system helped save thousands of lives. But it also placed new, and serious responsibility on regimental medical stations. Therefore I made a point of visiting them as often as I could.

On one occasion I got in a very tight spot. We left for the field hospital early in the evening. Our jeep behaved very queerly, now dashing ahead, now spluttering and coming to a sudden stop.

"What's the matter with the car?" I asked the driver.

"I have no idea," he answered with a shrug.

"Call yourself a driver, do you?"

"I'm no driver either. I'm a cook. I only learned to drive recently. There was nobody else to take you."

We reached the hospital eventually. While I attended to my business there, the driver was helped by the hospital drivers to fix the jeep. It took them all night. Next morning there was to be a surgeons' conference at the neighbouring field hospital and I decided to try to make it, driving in daylight.

The moment we emerged into the open steppe, the "window-frame" buzzed its way to a position exactly above us. There was nowhere to take shelter. I noticed the "window-frame" prepared for a dive. A burst from a machine gun, I thought sickly, and it was curtains for us.

I saw a bulky object separating from the plane. Could it be a bomb? The next moment I heard a whistle, something hit me and I found myself lying in the ditch. I felt myself over—there did not seem to be any bones broken. I looked up and was amazed to see something that looked like huge snowflakes floating down from the sky.

It appeared that the "window-frame" had emptied several sacks of leaflets over us. One of them dropped on me, others broke up in the air, releasing a paper snowfall. My driver was in one piece, too, and was cursing lustily as he shook the dust off his tunic.

After we had collected our thoughts, we tried to start up our recalcitrant jeep. It succumbed to our ministrations at last and we

reached our destination without further mishap. In retrospect the incident appeared quite funny and was the source of many jokes.

Before the conference began, N. F. Grishina, senior surgeon of the 320th Rifle Division's field hospital who was playing host to the conference, warned me that participants from regimental medical stations would shower me with questions about their new tasks.

Well, Chief Surgeon of the Front G. M. Gurevich had made it clear that these stations should not confine themselves to dressing the wounds. Their surgeons must be able to fight shock, stop haemorrhages, make blood transfusions, apply splints and, finally, to produce Vishnevsky's vagosympathetic block in chest wounds and put hermetic dressings on "sucking" wounds in the thoracic cavity.

Some of these things, including closing up holes in the chest, were not new to the regimental medical stations, but, for some reason, they had never practised the vagosympathetic block.

Moreover, some of the surgeons argued that it was not feasible to use the block at regimental medical stations in view of its complexity, the lack of time and the danger of infection. However, these same doctors, once they had mastered the method, became fervent supporters of the block in chest wounds.

At that conference we established the extent of obligatory surgical aid at regimental level, including the block. Then the question arose whether the block was to be applied according to Vishnevsky's or Burdenko's method.

Burdenko's method was ill-suited for regimental medical stations. It required sterile conditions and special training (the surgeon had to be able to expose the neurovascular bundle in the neck). Vishnevsky's method was simpler technically, and involved no risk of damaging vital vessels and nerves. Any doctor could produce this kind of block. So, while recognising the merits of Burdenko's method, I gave preference to Vishnevsky's.

Later, when I came to Moscow with a report to Burdenko, I told him that, in my opinion, his method was hardly practicable in field conditions. Burdenko was not in the least offended, merely remarking that we had to fit our actions to the situation and not follow the rules blindly.

We also agreed at the conference that in all cases of limb wounds splints had to be applied after bandaging before the wounded were sent on, because a correctly applied splint meant a lot for the success of subsequent treatment.

After the conference, we decided to visit two or three of the nearest regimental medical stations. For this we had to walk some



five or six kilometres across steppeland. We walked very fast, in small groups of two or three, sometimes upright, and in the most dangerously exposed places we crawled. It was hard going for people without special training. I found myself in the group of stragglers, who reached the station last. We got quite a lashing for our ineptitude in infantry skills. I tried to joke my way out of it, but realised that if I wanted to be an efficient medical officer I would have to learn other skills beside surgical ones.

Later, I often had to go to regimental and even battalion medical stations near the front-line. Gradually I learned to make runs, crawl on my belly, shoot and even throw grenades. Our teachers were doctors from advance medical posts. The vicissitudes of front-line had taught them to wield the submachine-gun as well as the scalpel.

There have been cases when front-line surgeons and nurses received government awards for defending their wounded by force of arms.

Vasily Artamoshin, the commander of a surgical squad in the 48th Rifle Division's field hospital, and his team were decorated for giving battle when half encircled by the enemy. Artamoshin organised the defence skillfully. The hospital personnel beat back all the attacks and forced the enemy to retreat.

After that Major-General G. N. Korchikov, commander of the 48th Rifle Division, became a frequent guest at the field hospital. He became quite friendly with Artamoshin, and when the lorry in which the surgeon once rode blew up on a mine and he was wounded in the leg, the Major-General asked me not to send Artamoshin into the rear but leave him in the care of his own surgeons. "We need him badly," he said. "He's a fine man and a splendid surgeon. And what's more, he's an excellent military commander—if only we had more of his kind!"

Almost all through the summer of 1943 the 44th Army was on the defence, with only sporadic bursts of fighting here and there.

We used the lull to hold a conference of surgeons working in army and front hospitals. Chief Surgeon of the Front, Professor Gurevich, had recently made a trip to Moscow to attend the 7th Plenary Meeting of the Academic Council at the Chief Military Medical Directorate. The main topics under discussion at the plenary meeting were improving the quality of medical aid at all stages of evacuation and, particularly, restorative surgery as the principal method of treatment which guaranteed a speedy return to active service.

“It appears,” Professor Gurevich reported to us, “that about a third of all invalids discharged from the army could have been returned to the ranks had they received surgical and conservative treatment. Therefore, Chief Surgeon of the Soviet Army Professor S. S. Girgalov told us that the task of all surgical treatment at any stage of evacuation was to restore, in the shortest possible time, the health and fighting ability of every wounded man.”

We realised this placed immense responsibility on us army surgeons. Head of the Front Medical Directorate N. P. Ustinov advised us to bring hospitals up nearer to the troops' position before an offensive, but always retain some of them as reserves, ready for a quick move. We realised from this that major offensives were in the offing.

The conference concentrated on the work of regimental field hospitals and medical aid stations. The reason was that the latter confined themselves to debridement, dressing and immobilisation of limbs, while passing those with chest and abdominal wounds on to second-echelon hospitals. As a result the condition of these wounded deteriorated and precious time was lost when operative interference could have put the man on the road to recovery.

Many of the speakers stressed the need to organise specialised medical aid on an army level. All agreed that it was time for wider operative interference in abdominal wounds at the first stages. It now became possible in many cases to dispense with evacuation into the deep rear altogether. The wounded could be nursed back to health on the spot, while transportation usually aggravates the patient's condition.

We also discussed the problems of treating light wounds better. Following the example of other armies, we set up special hospitals for the lightly wounded, which attended to men with flesh wounds. These wounds could heal more quickly with a light operation and various conservative therapies. Formerly such wounded, sent into rear hospitals, used to lose all contact with their units. Now, after treatment, they returned to them quite quickly.

At the Rostov conference I met a colleague, a docent from our clinic, Ivan Minayevich Papavyan. We were very glad to see each other. He had been through a lot of trying experiences, his hair had turned gray and he looked older than his years. Obviously, in the past two years work as an army front surgeon had taken their toll. He gave me a lot of useful advice, and said in parting: “Try to be always there where there are many wounded. Let others sit at headquarters.”

On returning from Rostov, I made a detailed report about the conference to the 44th Army's Head of the Medical Service Alexander Markovich Tarasenko.

Colonel Tarasenko had risen from regimental surgeon to head an army's medical department. He had served for many years in the Far East, in the vicinity of Khabarovsk and Blagoveshchensk, moving with his unit from one out-of-the-way corner to another. "I've never stayed in one place long enough to start a family," he told me sadly.

He did his best to help me improve the field hospitals. Often we visited them together. On the road he liked to tell stories about his soldiering. A recurring theme in his stories were the dressing downs he had got from his superiors for failing to make a formal report, for not being smart enough, and the like.

Indeed, reports and deportment were almost a fixation with him. When we expected the Head of the Front Medical Directorate on an inspection tour, Colonel Tarasenko would straighten his tunic and shoulder-belt incessantly and generally be extremely nervous. When at last the car drew up and the general climbed out, Tarasenko would sprint forward, stop short precisely five paces from the general, salute smartly and rap out his report. After that they shook hands, very pleased with each other.

When, for our part, we inspected hospitals, Colonel Tarasenko would get extremely annoyed if the hospital head failed to report according to form.

A prominent obstetrician, Gleb Vladimirovich Stepanov, was the head of our major hospital for light wounds. He was a gentle man, with no aptitude for military drill whatever, and his reports were usually rather incoherent. But he was an excellent organiser and would deploy a hospital in no time in a building apparently quite unsuitable for the purpose. His staff were very fond of their chief, a fair and easy-going man. On the way to his hospital I would talk myself hoarse trying to persuade Colonel Tarasenko to overlook Stepanov's military ineptness, for this in no way detracted from his ability as a surgeon and organiser. Tarasenko was very well aware of this too, but it was only with a great effort that he could restrain himself from giving Stepanov a good trouncing for some slip or other.

But then an incident occurred, which changed Tarasenko's attitude of Doctor Stepanov.

Once Stepanov received an order to deploy a hospital for 600 beds in a small town. All he had at his disposal was one cottage, a school and club, both half-ruined, and five tents. At first

Stepanov decided that under the circumstances the order simply could not be carried out. But the situation was such that he either had to do the impossible or hundreds of wounded would be left unattended. When four days later Tarasenko arrived in the village in person to see how the hospital head had coped with the difficult task, he was amazed to see the hospital all ready to receive the required number of wounded. He could not but commend the hospital head for his ingenuity.

Colonel Tarasenko introduced me to army ways. He told me, for instance, that when the unit is engaged in fighting, our superiors leave us alone. It was when the army was in defence or withdrawn to the reserve that inspections reached their highest pitch. The Front Medical Directorate inspected us, and we, in our turn, inspected the hospitals, and hospital heads, in their turn, went to regimental and battalion medical posts. That was the time when everybody was drawn over hot coals.

Tarasenko often reprimanded me for not being exacting enough. "Arguments and persuasion are not for the army," he used to say. "Issue an order, and your subordinate must carry it out and report fulfilment."

In this way Colonel Tarasenko inculcated in me, a civilian doctor, qualities essential for a medical officer. I must admit, however, that all his efforts, plus my long term of army service failed to make me a proper army-man.

This is not to say that I did not follow his advice, as regards my role during active fighting, when many wounded accumulated at the hospitals and I yearned to help the surgeons operate on them.

"Do not forget that you are not merely a surgeon," he would tell me, "but an organiser of the surgical service."

What his arguments boiled down to was that even a hundred surgeons could not undo the harm done by poor medical organisation.

I understood the truth of what he said, but often found it impossible to suppress my "surgeon's heart". So, when another bout of fighting came to an end, I went off to inspect my field hospitals. I'd stay at one that was particularly overloaded with work and take my place at an operating table. But as the time went on it became more and more obvious to me that an army surgeon's main concern should be the organisation and tactics of the army medical service.

At that time every army had some 20-25 hospitals (most of them surgical ones). Each was designed to receive some 200-300 wounded, but was expected to be able to cope, in an emergency,

with twice that number. Each hospital, as a rule, had a full supply of equipment and the required number of doctors, nurses and orderlies. If we were to divide the number of wounded by the number of available hospitals, the pressure on each would not seem so very bad. Especially if we bear in mind that some wounded were evacuated into rear hospitals. Remembering the critical situation we had found ourselves in at Tormosin, when I was a hospital senior surgeon and when we received no help from anywhere, I now tried to ensure the most rational use of all available hospitals. I found that a practical solution to this problem was not easy. When the army is advancing approximately half of the total number of hospitals should be kept in reserve, so that they could be sent where the need is greatest. Meanwhile, we tried sending their personnel to help at hospitals which were working at full swing. This relieved some doctors and nurses somewhat, but had little effect on the capacity of the hospital and the number of wounded treated. So, to begin with, we failed to devise a method of using the available medical personnel to the best effect. Better results were achieved in some other armies.

I once ran into my former college mate, Victor Andreyevich Bukov, who was Head of the Medical Department of the 13th Army. At one time we were post-graduates at the First Moscow Medical Institute, I in the operative surgery department and he in the pathological physiology department. We talked about our work, and Bukov told me about their mobile surgical teams, which had first been used during the Finnish campaign. The team would have several ambulances and lorries, a staff of well-qualified surgeons and nurses, tents for setting up a dressing station and an operating room, an autoclave and a supply of surgical instruments. The team was sent to the hardest pressed sectors. On arrival at a field hospital, the team would pitch tents, fit out an operating theatre and dressing station and set to work at once taking on a portion of the wounded. This was a very effective way of helping.

In some armies they had medical reinforcement companies, which included several surgical teams with different (maxillofacial, ophthalmological, general surgical, neurosurgical, etc.) specialities. The hospital to which this company was temporarily attached could cope with the wounded who had head, stomach and chest wounds.

In the 13th Army they had extraordinary surgical teams. There was one at every hospital. Each such team had all the necessary equipment, staff and transportation. On receiving an order to help some medical station, the surgical team of a reserve hospital would

reach the destination quickly and set to work. When the stream of wounded abated, the team would return to its own hospital. During major military operations the army surgeon could send out some five or six teams in addition to medical reinforcement companies.

Bukov told me how they organised medical aid to the troops during the Orel-Kursk operation. At the Ponyri station on the left flank of the 13th Army, there had accumulated many wounded men, who had arrived from their own regimental medical stations and from their neighbouring army's. Army Surgeon Colonel V. I. Struchkov and Head of the Army Medical Department sent a reserve hospital and four surgical teams from other hospitals to this location. These set up 24 dressing stations and 8 operating rooms and soon the congestion was eliminated.

"However," Bukov continued, "we are no longer satisfied with temporary organisation of specialised medical aid. We wanted to have permanent specialised hospitals which we could shift about in the course of a military operation. Such hospital would give both doctors and nurses a chance to amass valuable experience and know-how in nursing particularly severe cases.

My conversations with Bukov were extremely useful. Gradually, step by step, I was learning the intricacies of my variegated duties as an army surgeon.

One of the most onerous jobs was evacuating the wounded, even though a special department had been placed in charge of this.

It would appear that the well-adjusted system of "evacuation to oneself" had proved its worth. According to this system, every hospital head, beginning with the battalion medical station and ending with front hospital, was obliged to collect the wounded from the preceding stage. This was governed by medical service regulations. In practice, however, this principle was strictly observed only at medical station level. At all the other stages hospital heads were responsible both for bringing the wounded to their own hospitals and for sending them on. So evacuation was often quite a problem, especially when roads were bad and the distances great. Manoeuvring with hospitals was not easy because of the lack of transportation and too many wounded. Then we thought up a novelty: we started bringing a "cluster" of hospitals up to the front-line including general surgical and specialised hospitals, a hospital for lightly wounded, and infectious and therapeutical hospitals.

This method precluded the overloading of separate hospitals and made for more smooth work. I must note here, however, that

sometimes we consciously allowed for a certain overloading of some hospitals. In expectation of major advances, when many wounded were expected, it was expedient to have as many reserve hospitals as possible that could follow the advancing troops and deploy as the need arose. And not the entire hospital would be deployed either, but only its operating theatre and dressing quarters, while the rest, the pharmacy, the provisions and such like, remained in the lorries. This made for greater mobility.

The lull on our section of the front came to an end. In the late summer of 1943 the 44th Army started an offensive. Its units broke through into Taganrog and moved on further west. They smashed the enemy defences around several strongholds and cut an important artery along which the Hitler command had been sending reinforcements and supplies to its armies bottled up in the Crimean peninsula. At last our troops reached the Dnieper. Across the river, straight opposite us, was Kakhovka.

The speedy advance stretched our communications. The hospitals had to chase after the advancing troops before they had time to deploy properly.

In those days I spent most of my time on the road, going from one hospital to the next. Then I would return to the Army Medical Department, report on the situation to Colonel Tarasenko and we would plan our work for the next few days.

As though casually, while inquiring about the situation at one field hospital or another, Tarasenko would slip in a question about Nina Fedorovna Grishina the senior surgeon of the 320th Division's field hospital. I gathered that his interest was not merely a professional one and once permitted myself a joke about his tender feelings for her. But the Colonel was so annoyed that it became obvious to me that this was no joking matter.

From then on I made a point of dwelling at greater length on the situation in that hospital and described the operative skill and managing efficiency of Nina Fedorovna in glowing terms. Tarasenko would hang onto my every word and look positively blissful.

Sometimes we visited that hospital together. As a rule, Alexander Markovich would just hover in the doorway of the operating room for a while, watching Nina Fedorovna officiate, scalpel in hand, and would then go off without exchanging a word with her. The next time I came to the hospital, Nina Fedorovna would complain to me exasperatedly:

"Calls himself a man, too! Couldn't he wait until I finished the operation?"

In parting she would invariably say: "Tell him to come over one of these days—there are many things I want to discuss with him."

It was hard to tell if their mutual interest was to develop into a stable relationship. They were so different, so unlike one another. On the other hand, don't opposites feel drawn together? Well, actually, they did eventually get married, but not until the long and hazardous roads, the endless packings and unpackings and sleepless nights were forgotten.

One day I was driving along a rutted front-line road. Cold rain was drumming on the jeep's canvas top and the wipers barely coped with the streams of water on the windshield. The driver kept his door open to detect and skirt deep impassable pools. He needed all his intuition to avoid getting stuck. Thus, scaling one obstacle after another, we finally reached a crossing where we were stopped by a traffic controller, a blond girl in a cape that was soaked through. Imagine a young girl alone in the steppe, bravely holding fort and checking documents of bristle-faced soldiers. Yes, one could not but admire those girls!

"Comrade Lieutenant-Colonel," she addressed me, "could you take a major in your car? He is going the same way and is frozen stiff."

"Very well."

The major in question came along. He was short and dark.

"Are you going to your unit?" I asked him.

"No, I'm a front-line correspondent of the Sovinformburo and I have an assignment to write a series of articles about front-line units," he answered.

"Perhaps you know my brother Pavel Kovanov? He's a front-line correspondent too, working for Radio Moscow."

"What, are you Pavel Kovanov's brother?" the major exclaimed, jumping up in his seat. "Of course I know him, he's a good friend of mine. I met him recently on the 2nd Ukrainian Front. My name is Liloyan. I'm very glad to meet you."

Naturally enough, I showered Liloyan with questions about my brother.

"Oh, he's fine. He's in good health and good cheer. You're a doctor, aren't you? He told me about you—that you were a surgeon and also at the front."

"He's a big man," Liloyan continued, laughing. "Do you know how we've nicknamed him? The Tractor. When a car gets stuck, he just gives it a shove with his shoulder and out it pops. And he's



brave too. When the Dnieper was forced, he and Boris Polevoi from *Pravda* crossed with the advance platoons. God must have looked after them. I found out about it from the regimental commissar—Pavel never said a word. But once he said to me: 'We must advance with the soldiers, Lilo (that's how he calls me), and not write despatches from other people's words. We must see things with our own eyes.' "

Before we knew it, we had reached the hospital. There I took leave of my cheerful companion who had gladdened my heart so with news about my brother. I never met Liloyan again and after the war found out that he was killed in Yugoslavia.

On our bank of the Dnieper the Germans held a tongue-like strip of land—the Nikopol bridgehead. They were deeply entrenched and kept up a constant harassing artillery fire from their strongly fortified positions. Since the locality thereabout was as flat as a pancake and there was no natural shelter whatever, this caused us a lot of unpleasantness.

The "Nikopol tongue" was an eyesore. The enemy made audacious sorties, one of which ended tragically for Lieutenant-General Khomenko, the commander of our army. After an inspection tour of our positions, the command car ran into an ambush set up by an enemy raiding party. General Khomenko and commander of the army artillery were killed.

Soon after, our 44th Army was withdrawn, and replaced by the neighbouring 28th Army.

The next day Alexander Markovich Tarasenko and I sat talking for a long time, waiting for our orders. Neither of us knew that we had both received new appointments, he as Head of the Medical Department of the 28th Army and I as its Army Surgeon.

### **Order No. 220**

The autumn of 1943 brought with it impassable mud on the roads, which impeded the evacuation of the wounded and caused difficulties with provisions and medicines. Again we began to make wide use of fresh bullock blood. We even thought up a name for our cocktail: haemocostol.

Its beneficial effect is easily explainable. Fresh bullock blood contains proteins, salts and hormones which are easily assimilated by the human organism and which activate all the essential processes. Given some 100-200 grammes of haemocostol a day, the general condition of the wounded improved, they developed an

appetite, gained weight, and their entire system was toned up. And the main thing—their wounds healed fast. These excellent results set us thinking about finding a constant source of fresh bullock blood.

We talked it over with General A. N. Tsibin, Chief of Logistic Services, who had already known about our experiments. He gave orders to select 200 bullocks and dry cows for us. The herd was put in charge of veterinary surgeons.

Soon the Front Medical Directorate got to know about our station for the production of haemocostol. Someone from the Directorate came along to inspect it. He found a well equipped mobile station, complete with laboratory, an installation for washing the equipment and all the necessary instruments. The whole establishment was in charge of a young energetic surgeon Valentin Lysenko.

Initially we had difficulties with containers for the blood. Ordinary bottles were hard to sterilise. Soon, however, we got hold of a large consignment of 200-gramme bottles for baby food. They were graduated and washed easily and contained exactly the right dosage.

With the help of veterinary surgeons we developed a new method of taking the blood. A section of the neck, near the jugular vein was shaved and the skin was swabbed with alcohol and iodine. A tourniquet was applied below the place to be punctured and then a thick needle was introduced. Along a rubber tube attached to the needle the blood went into sterilised bottles. We then added some sodium citrate and glucose solution and haemocostol was ready for use.

The addition of sodium citrate prevented the blood from coagulating, and it could be preserved in a cool place for a fairly long time. And the glucose neutralised the salty taste.

We took some 2-3 litres of blood from an animal at one go, after which it was given a ten-to-twelve-day rest. The blood was packed and carted to the hospitals.

The Front Medical Directorate's inspector was obviously impressed, for soon after his visit I was summoned to the Academic Council of the People's Commissariat for Health to report on our use of fresh blood. I also read a paper to a conference of surgeons from the 28th Army and the joint conference of the Front's surgeons and therapists. The Army Therapist R. I. Sharlai gave us his unqualified support.

Soon we were informed that on March 23, 1944, the Presidium of the Academic Medical Council chaired by Professor I. P. Razen-

kov discussed our proposal about the use of cattle as donors of fresh blood and decided that doctor Kovanov's suggestion was theoretically and practically feasible. It recommended that the use of animal blood should be promoted as an undertaking of state importance; it also commended the initiative of the method's originators.

Subsequently we came to use haemocostol in the treatment of internal and infectious diseases as well.

Soon we made another discovery—fresh blood was also very effective against night blindness, which suddenly smote some of our troops.

With time we learned to modify the properties of haemocostol depending on the use we were going to make of it. For instance, when it was to be used against avitaminosis we fed the animals with lucerne, which contains a high percentage of vitamin A.

Our method of obtaining and conserving fresh animal blood and its use in the treatment of the wounded and the sick was soon adopted by the neighbouring armies.

On May 16, 1944, Head of the Central Medical Directorate of the Soviet Army Colonel-General of the Medical Service E. I. Smirnov and Head of the Military-Veterinary Department Lieutenant-General of the Veterinary Service V. M. Lekarev issued Order No. 220. It read:

“For eighteen months, on the suggestion of Army Surgeon Major Kovanov, fresh cattle blood has been used in treating the wounded and sick in the armies of the 4th Ukrainian Front, where Colonels Tarasenko and Gerasimov are Heads of the Medical Service, and Colonel Ukhtomsky and Lieutenant-Colonel Katelikov are Heads of the Veterinary Service.

“In appreciation of the useful initiative in promoting this important experiment, Army Surgeon Major of the Medical Service Kovanov, heads of the Medical and Veterinary Services of the Army Colonel of the Medical Service Tarasenko, Colonel of the Medical Service Gerasimov, Colonel of the Medical Service Ukhtomsky and Lieutenant-Colonel of the Veterinary Service Katelikov are hereby given official commendations.

“Heads of the Medical and Veterinary Service of the Fronts are ordered:

“1. To organise in army and front dislocation areas stations for obtaining fresh blood from cattle, using for the purpose cattle earmarked by the Commissaries of Fronts and Armies.

“2. To carry out the selection of donor-animals, the taking of

blood and its preservation and use for medical purposes in accordance with the instructions attached.

"The order is to be made known to all medical and veterinary surgeons."

This order did much to promote animal donorship and the new method of treatment on other fronts as well.

I might jump forward and mention here that when Soviet troops entered Eastern Prussia where we found plenty of cattle which the nazis had not had the time to drive away, the diet of our wounded was replenished with high-calory food like beef, pork, veal, poultry, etc. Yet even then our station continued to obtain blood from the cattle and cart it to hospitals, though naturally the wounded now preferred a steak or a veal chop to a glassful of fresh blood.

### III. WE ARE MOVING WEST

*He who had the strength to live through such things, must have the strength to remember them.*

A. G. Herzen

#### In the Forests and Swamps of Byelorussia

In the autumn of 1943 Soviet troops, having liberated parts of southern Ukraine to the east of the Dnieper, reached the jump-off point for an attack on Odessa. Our 28th Army, however, was moved north to the Gomel area in Byelorussia. Logistic services and support units and establishments including the medical corps were garrisoned in Novozybkov.

The town had suffered terrible destruction at the hands of the retreating nazi troops. Not much was left, and it looked very like the aftermath of a violent tornado. The houses lay in ruins, telegraph poles were down and desolation reigned supreme.

Rebuilding began almost immediately. The people of Novozybkov, women and old men for the most part, were helped by soldiers. Understandably, engineers and sappers were the most

enthusiastic of all and were very much to the fore in the rebuilding effort. They were happy to be once again engaged on a civil mission. It was a welcome change from digging trenches and dugouts and building fortifications. It was quite another matter building a house for civilians who had been through so much suffering caused by the war. They felt sure that the occupants of the house they restored would retain grateful memories of the builders in army uniforms.

While we were stationed in Novozybkov I ran across Ivan Shmelev, a friend from my college days. He was a pupil of P. A. Herzen's, and was considered a promising surgeon. Now he was senior surgeon in a front hospital specialising in neurosurgery. He had mastered the delicate art of operating on cranial and spinal wounds and treating purulent cranio-cerebral injuries. I must admit I felt flattered when he told me that he had read my paper on the treatment of cranio-cerebral injuries, based on my work at Rostov hospital. Shmelev became interested in our method of administering sulphidine solutions into the carotid artery in purulent inflammations in brain, and its practical results. For his part, he told me that N. N. Burdenko had recommended the intra-arterial administration of penicillin as an effective treatment in cranio-cerebral injuries.

During that long conversation with Shmelev I realised that he felt cramped in his specialised hospital which did not allow him sufficient elbow room. One day I asked him whether he would not like to gain more room for manoeuvre on the organisational side. The fact was, at the time we were looking for a good head surgeon but could not find a suitable candidate. I felt that in Shmelev we had just the man for the job. He had experience, was well-trained and had a dynamic personality. When I put the suggestion to him he immediately accepted.

The next morning I duly informed my chief Lieutenant-Colonel Tarasenko about my "discovery". The chief approved my idea and proceeded to ask the personnel manager to send a letter to the Military Medical Directorate requesting Major Shmelev to be attached to our establishment. In a couple of days the request was granted.

Happy at the news I went to see Shmelev to hand him a mission order. I was somewhat taken aback when he said, "You know, Volodya, I think I was a bit hasty. On second thought, I feel I am reasonably happy where I am. Another thing is that I'm not alone, my wife and daughter are with me. There will be no one to care for them properly if I go."

“Listen, we can’t call it off now. After all, you asked for it yourself, didn’t you? I did what I could to help. It’s too late now to change anything.”

After some consideration Shmelev said, “Very well then. But you’ll have to speak to my wife about it, I daren’t!”

Fortunately, his wife was very reasonable, although not overjoyed. When she saw her husband’s mission order she realised that any arguing would be a waste of time: her husband’s new posting could not be reversed. Fighting tears, she managed a smile and said: “Please don’t worry about us, Ivan. We will go to Gorky and stay with your parents.”

That was how I. V. Shmelev joined the Medical Corps of the 28th Army. Years later, when he was a professor and headed the surgical department of the medical college in Krasnodar, he liked to recollect his days with the army in the field and proudly showed his students his war medals.

But to get back to our life at Novozybkov. The hospitals and medical aid stations that had arrived with us from the South had to get used to very different natural conditions. When we were in the South we had adapted to the steppe and to the summer heat. We



A field nurse bandages a wounded soldier. Leningrad Front. June 1942

had become good at digging ourselves in near the battle zone. But in Byelorussia we had to contend with a totally different set of problems. The area was covered with dense forest interspersed with swamps and there were no roads worth the name. When it was not raining, which was rare, we were attacked by swarms of mosquitos that showed us no mercy. At night we suffered from a bone chilling damp even in summer. Our underclothes were always clammy.

We had no previous experience of operating in forest areas. The new situation posed new problems in administering first aid in the combat area and in removing the wounded from the battlefield. Whereas in the South a wounded soldier ran no particular danger if left lying in the field for a reasonable period of time until he was picked up by stretcher-bearers, in Byelorussia no such thing could be allowed. Drenched to the skin, a wounded soldier could develop a serious complication within an hour. In short, the Byelorussian campaign presented many problems and made medical attendance more difficult. Every contingency had to be provided for.

I was lucky to associate at that period with Professor S. I. Banaitis, Major-General of the Medical Service. Professor Banaitis was an eminent theorist in military medicine and a brilliant surgeon. Short in stature, thick-set and full of go, he could talk for hours describing the very special circumstances and tasks of the medical services under local conditions. "Remember," he would tell us, "your first job is to make a wounded man warm and dry, even if the man is not gravely wounded. Make sure that the heads of hospitals and medical aid stations are aware of this and never overlook it. A good bath is both an important procedure in the treatment of the wounded and also a prophylactic measure to ward off any complication."

He explained in detail how to set up special wards for dealing with shock.

"It is important," he said, "to organise blood transfusions in all medical posts at the regimental level. You must make extensive use of the vagosympathetic block and subperiosteal anaesthetic in cases of gunshot fractures of the limb. (The general referred to anaesthetic of the fracture site while the extremity was immobilised by a splint.)

"It goes without saying that the proper immobilisation procedure in fractures and measures to stop bleeding from ruptured blood vessels cannot be overstated; you know that better than me. But remember that in this god-awful kingdom of swamps every element of surgical help takes on added importance



Bringing a wounded man from the battlefield. The medical station of the 318th Rifle Regiment, 38th Army, 4th Ukrainian Front. Poland. February 1945

precisely because the conditions you have to operate under are so unfavourable.”

...We were awaiting the arrival of a new Army Commander, General Luchinsky, who was being transferred from Sevastopol in the Crimea.

One evening an army jeep pulled up outside my house. General A. N. Melnikov of the Military Council got out and raced up the steps. He told me a plane would take me immediately to an air force hospital a good 150 kilometres away where General Luchinsky had to make an unplanned stop-over. The fact was that the General had started for his new posting before his wound in the thigh had healed properly. The journey was rather bumpy and as a result the general developed a very nasty abscess.

I found General Luchinsky extremely annoyed by the turn things had taken. There he was on his way to take command of the 28th Army which would be committed to battle in a matter of days, perhaps, and the doctors insisted on immediate hospitalisation. God only knew how long it would take for the



wound to heal over. After examining the wound, I decided to try my own method of treatment which consisted in drawing away the pus from the purulent focus followed up with penicillin injections. Luckily, the hospital had an adequate supply of penicillin. A series of injections were supplemented by physiotherapy. Three days later the Army Commander was back on his feet and in another week arrived at headquarters to take charge. Incidentally, that encounter was the start of my close friendship with Alexander Alexandrovich Luchinsky.

In early summer of 1944, troops of the First Byelorussian Front were engaged in heavy fighting. Beating down fierce enemy resistance, the Soviet forces moved inexorably west towards Bobruisk and Minsk.

The 28th Army, at one time part of the Supreme Command Reserves, was now assigned to the First Byelorussian Front. Within a few days its units crossed the Dnieper at Rechitsy and took up positions on the Ozarichi-Mozyr line.

In the beginning, we found it extremely difficult to negotiate the swamps and marshy terrain of the Polesye region. Some of the regimental medical aid stations could only be located with the help of local people who acted as guides. At night, however, even they could not be of much help. There were no roads to speak of. I can still remember how on many occasions we would have to actually float along rather than drive in our battered jeep.

As I think back to those days, I cannot help marvelling at the uncanny ability to anticipate the start of an offensive that we had all developed. From barely perceptible signs and indications we all knew we would have to go into battle very soon.

On Marshal Zhukov's orders each division in the first echelon formed one or two specially equipped assault battalions which were assigned the task of breaching enemy defences at different sectors of the front. One day General Pliyev's cavalry units arrived at our base camp. At night artillery men were moving their formidable hardware into position. Every unit stationed in the area was busy making improvised sledges and skis to make across the swamps during the coming attack.

The great offensive got under way in the early hours of June 23. The artillery was the first to go into action. This is how General Luchinsky described the day in his memoirs: "The panorama of the great battle that unfolded before our eyes was formidable and overpowering.... An estimated 2,000 shells and mortar bombs burst every minute and the ground was shuddering under the impact of the countless explosions. The clouds of smoke and dust that

screened the horizon were pierced by the arrows of fire as Katyusha rocket batteries let loose volley after volley. In the skies over the battlefield masses of planes were engaged in determined dogfights....”

When our infantry went over the top, the artillery continued to provide support setting up a double barrage just in front of the advancing troops. Men of the 55th Irkutsk Guards Division slammed into the enemy. Beating down the stiff enemy resistance in and around Pruzhinishchi, our forces took the town and swept beyond in hot pursuit of the retreating nazis. Regular troops got a lot of support from the partisans who operated behind enemy lines.

I was astounded by our division's rapid advance. Undaunted by the difficult conditions, with the men actually carrying their fighting equipment on their backs and pulling artillery pieces and other heavy equipment across the swamps, they kept up the pressure and moved inexorably forward. One could not help admiring the staunchness, endurance and resourcefulness of the Russian soldier.

On June 29, 1944, the troops of the First Byelorussian Front completed the Bobruisk operation, surrounding and wiping out a 40,000-strong nazi grouping. The corps and divisions of the 28th Army, which had taken part in the operation, later received special mention in the order of the day issued by Commander-in-Chief Stalin. They were praised for their valour and fighting efficiency during the breakthrough south-west of Zhlobin. Soon afterwards a gun salute and fireworks were given in Moscow to mark yet another victory for Soviet arms.

Meanwhile, the 28th Army continued to advance in the direction of Pinsk-Baranovichi. We followed in the second echelon and at one point set up a surgical hospital using what remained of the local hospital in recently liberated Slutsk.

As the army surgeon, I received reports to the effect that the hospital was overcrowded and the staff were getting snowed under with work. Accompanied by a group of surgeons from the medical reinforcement company I left for Slutsk. Roman Sharlai, Army Therapist, was with me on that occasion.

Sharlai was an excellent specialist who received his clinical training in Kharkov. He had been with the 28th Army from the start. Tall, slender, and smart, he was very kind, responsive and cooperative. He always had his hands full, irrespective of whether there were active hostilities or not. During lulls in the fighting people always came to him to ask for medical advice. And not only staff officers but also ordinary men from the ranks and veteran

soldiers from the logistics and support units. To my knowledge, there was not a single case when Roman Sharlai refused to help. His own field kit was always full of powders, vials, bandages and even mustard plasters. He also carried an instrument for measuring blood pressure just in case. He even had a set of cups, which he could apply as expertly as a trained nurse. Roman Ivanovich was intimately familiar with the case histories of many officers and kept a watchful eye on their current complaints. I remember that he paid regular visits to an officer with a long history of ulcers and another who suffered from a gall bladder complaint. He often advised and provided them with the right remedy to prevent the disease from deteriorating.

When the army went into action again, and the field hospitals filled with the wounded, Roman Ivanovich would help the young doctors to nurse the gravely wounded in the post-operative period, diagnose complications and provide the necessary treatment. The doctors always followed his advice and recommendations and he was invariably welcome in the wards, where his attention and care was very much appreciated.

I remember one particularly hectic day when most members of the staff were so tired they could barely stand. I decided to relieve one of the surgeons to give him a chance to get some sleep. A wounded soldier was brought in with a shell splinter wound in his stomach. He had been brought in an hour and a half previously in deep shock with no palpable pulse. The doctors who examined him did not put his chances high. Nevertheless, they did what they could. They made the poor devil warm, gave him anti-shock injections and a blood transfusion. And now he was on the operating table.

He was a young lad. The features of his face were sharpened and pinched, and his eyes had ghastly bluish rings under them. He was only semi-conscious. I decided to operate under local anaesthetic, deciding that I would place him under general anaesthetic if the need arose. When I opened the abdominal cavity I saw that the intestines were floating in their own contents. After I had made a careful examination of the convolutions of the small and large intestines and was satisfied that they were not damaged extensively. I pulled out the damaged convolutions and had a good look inside the cavity to see if the liver or kidneys were damaged. Luckily they were not. To save my patient any additional pain, I injected an ample dose of novocain solution into his mesentery and the abdominal membrane and also into the solar plexus, as Vishnevsky had recommended. I carefully dried the abdominal

cavity and the pelvis and stitched up the holes in the small intestine. I worked as quickly as I could. Simultaneously, 500 cubic centimetres of fresh blood was put into the lad.

When the operation was over everybody heaved a sigh of relief. The man was transferred to the post-operative department where they would keep him under close observation.

I barely had enough time to wash my hands and put on a fresh smock when another wounded man was placed on the table. His right shin had been mangled by a mine explosion. Actually, what was left of his shin was a gastly mass of torn tissues dripping with blood. The shin bones were crushed completely. It was clear that it would be impossible to preserve the foot and amputation was the only answer. The man pleaded with me not to cut his foot off. It was with a very heavy heart that I persuaded him it was not physically possible.

After putting the man under local anaesthetic I began by cutting out a skin flap with which to cover the surface of the stump. I then made a deep incision through the muscles right to the bone. Then I sawed through the bones. That done, I covered the surface of the stump with the flap. Next I put well-spaced stitches on the skin, while round the edges of the flap, I inserted two small cotton tampons to absorb any secretion of the sanies that might follow.

Later that evening nazi bombers appeared over the city dropping their lethal cargoes on the houses, schools and our hospital. I heard the sound of crushed glass and the lights went out. One of the bombs scored a direct hit on the barrack where a well-known Byelorussian surgeon D. was operating at the moment.

A few minutes later the surgeon was brought in with part of his legs torn off and bleeding profusely. Before putting him on the operating table I put Kocher clamps on the bleeding vessels, ligated them and started a blood transfusion. The blood would not flow, however, because of the drastic drop in the man's blood pressure. The nurse gave him a shot of morphine and caffeine. Now was the time to start the surgical treatment of the wounds. Just then a bomb went off quite close to the operating room. I was knocked off my feet, hit my head on something hard and passed out for a few moments. When I came round and got back on my feet I resumed the operation. But I could see that it would be impossible to save my colleague's life. I had barely enough time to put on a fresh dressing and apply a splint when a new raid began. It was followed by another and another at short intervals. The howling of diving Junkers and the thundering explosions continued all through the night. At dawn the surgeon died. The funeral

was attended by the entire population of Slutsk. There were many local partisans among them. These tough people were so grief-stricken that they wept openly. During nazi occupation the dead man had been the partisan doctor and had saved many lives.

...We pushed on through impossible terrain dominated by swamps and thickets in the wake of our 55th Division.

It is to the division's medical corps credit that they had been able to adapt to the difficult conditions pretty quickly and organise efficient teams to remove the wounded from the battlefield, make them warm and rush them to the medical aid stations and first-echelon hospitals.

In Byelorussia field hospitals were not housed in dugouts, as in the South but in big long makeshift barracks, with plank-beds fixed high above the floor. Adjoining the barracks were special premises for drying clothing, and a steam bath. The hospitals' surgical service covered the full range from simple operations to complicated cases, for example, cranial injuries and injuries of the chest, abdominal cavity and extremities.

Some surgeons preferred to deal with injuries of the abdominal cavity under general ether anaesthetic, while others opted for local anaesthetic as recommended by Vishnevsky. Whenever I had to make an extensive revision of the abdominal cavity or an excision of the intestine, or stop bleeding from the liver or the spleen I preferred to operate under general ether anaesthetic. In less serious cases I usually employed a 1/4 per cent novocain solution by the "creeping infiltrate" method.

The wounds to the larger joints were more of a challenge. In such cases it was impossible to excise dead tissue in full and thereby achieve 100 per cent sterility. Moreover, there were many other factors, besides the surgeon's proficiency.

For all that, despite the difficulties and problems we had to encounter daily we had gained considerable experience and learned to do many things during the war years. Suffice it to say that almost 90 per cent of those with abdominal wounds were now operated on at medical aid stations and first-echelon hospitals. Doctors mastered the technique of fighting shock, producing the novocain block, giving subperiosteal anaesthetic and blood transfusions and finally, which is most important, learned to perform operations quickly and efficiently.

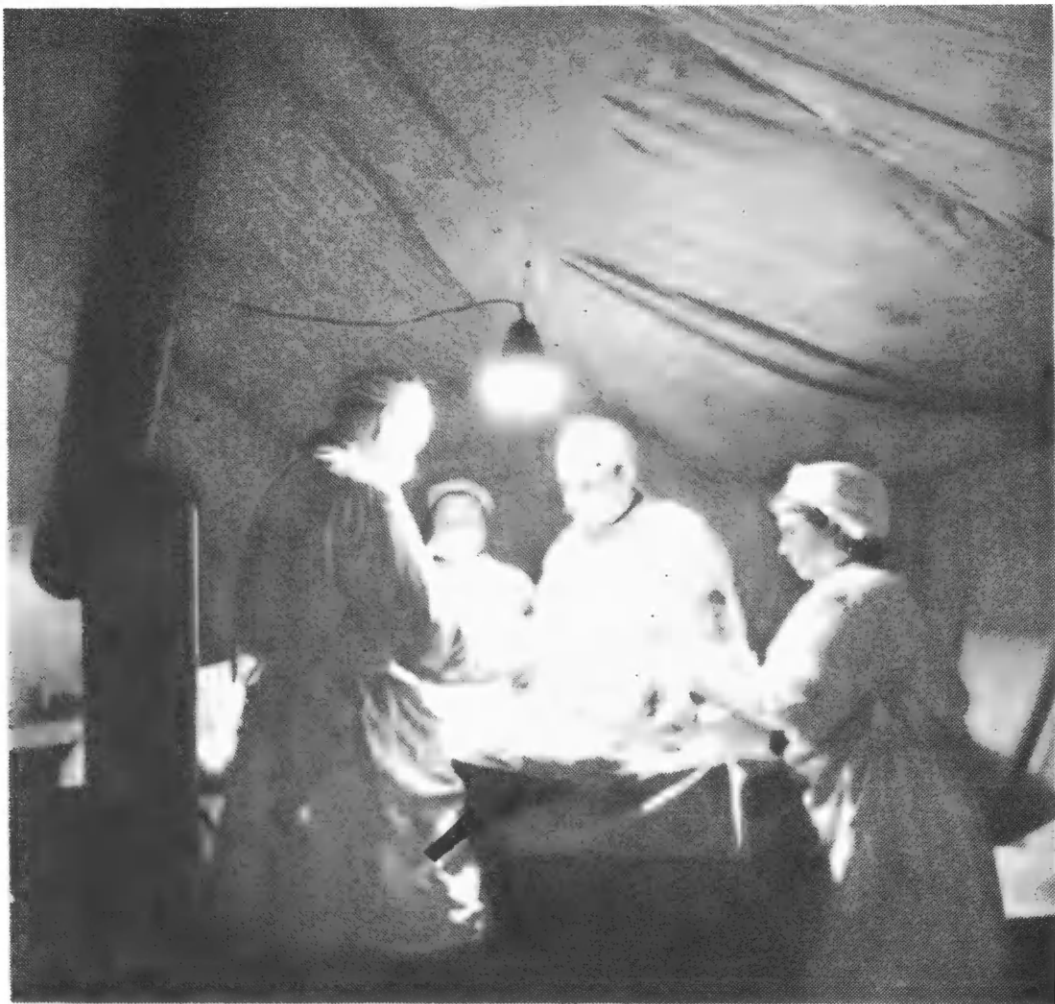
### **The Outstanding Surgeon**

We were awaiting the arrival of S. S. Yudin, Chief Surgeon of the Sklifosovsky Institute in Moscow, who had been posted to the

First Byelorussian Front. Soviet troops had already reached the state frontier and had crossed into Poland.

Sergei Sergeyevich Yudin was an outstanding surgeon and an eminent scientist and pedagogue. We had always looked forward to the appearance of his scientific papers or his contributions at surgical conferences and congresses. They always marked a new step forward in surgery. His operations on the alimentary tract were astounding. Not only did he operate well and in beautiful style but he also worked out new types of operation. For instance, he modernised the operative techniques in constriction or obstruction of the esophagus, an operation pioneered at the turn of the century by the Swiss surgeon Roux and by P. A. Herzen in Russia.

Yudin introduced many new original modifications into operative techniques of stomach affections and in extensive duodenal ulcers. Following his example, most surgeons, instead of performing a purely palliative operation—the establishment of an anastomosis between the stomach and the intestine—began to excise the ulcerated areas of the stomach.



The operating theatre of a divisional medical station. Debridement of the wound. Volkhov Front, 1944

But perhaps Yudin's *tour de force par excellence* was the use of cadaveric blood for the treatment of his patients. This bold departure from traditional practice had been preceded by extensive experimentation under Professor Shamov.

At the congress of Ukrainian surgeons in 1928 Shamov surprised his audience by announcing that he had succeeded in saving the life of an exsanguinated dog by transfusing blood taken from another dog that had died a few hours previously. It appeared that the blood taken from the dead dog retained its revivifying properties even after 10 hours. It was then decided to check out the results Shamov had reported on a human patient. It was some time before an occasion presented itself.

On March 23, 1930, the doctor on duty at the Sklifosovsky Institute in Moscow phoned Yudin asking him to examine a patient that had just been admitted. The man had cut his veins and had been bleeding profusely for a prolonged period. All measures to bring him back to life had failed. Yudin decided to take the plunge. The body of a man recently killed in a road accident was brought in. After taking a quantity of blood from the dead man, Yudin put it into his patient, who was lying on the operating table without any apparent signs of life. A few tense minutes later the patient started a palpable pulse, his face turned a rosy colour and beads of perspiration came out on his forehead. Another few minutes passed and the man "came to life". The possibility of "transplanting" cadaveric blood was proved for the first time in medical history! Needless to say, the importance of that discovery could not be overestimated.

Sergei Yudin always looked to the future and was tireless in his seekings and experimentation. To him surgery was a religion and he was its high priest.

When Sergei Sergeyevich discussed with us specific problems and distinctive skills needed in different professions, he invariably emphasised that the surgeon had to be in possession of a wide range of aptitudes. In his own words, "The surgeon is required to possess strong and nimble fingers like those of a violinist or pianist, the hunter's faultless eye, the artist's ability to discriminate between subtle shades of colour, the sculptor's sense of shape and harmony of the human body in addition to the seamstress' sewing skill and the embroideress' delicate art."

All these qualities and skills had been fully mastered by Sergei Sergeyevich. His talent and expertise as an outstanding medical scientist, surgeon and teacher who had founded an original school of surgery, were highly thought of both at home and abroad. He

was made an honorary member by the American Surgical Association and the Royal College of Surgeons and won State and Lenin prizes.

At first Sergei Sergeyevich's manner struck many as being affected and pedantic. But those who had watched him in action at the operating table or presenting his paper at a medical congress or reading lectures to student audiences, knew him well enough to overlook his mannerising.

At heart Yudin was simple and easily accessible to all who wanted to learn from him. And he had quite a lot to impart, being an inexhaustible mine of information particularly about field surgery.

Sergei Sergeyevich, as the Chief Surgeon of the Sklifosovsky Institute in Moscow, had gained a wealth of experience in the treatment of injuries sustained in road accidents. One, of course, cannot draw direct analogies between those war wounds but the methods of treatment of both share many common features. That is why we looked forward to Yudin's arrival. I met him in the Polish town of Minsk-Mazowieckie, where Yudin directed the surgical activities of a specialised hospital. He asked us, army surgeons, to send him patients with grave thigh wounds directly from regimental and battalion medical aid stations. The town was under intensive enemy bombardment when we arrived. Some of the shells landed quite close to the hospital. Still together with his colleagues, Sergei Sergeyevich had worked in the operating room for several days, hardly taking time-out. When four of my colleagues and I arrived in Minsk-Mazowieckie the hospital had 400 patients, most of whom had been attended to.

Sergei Sergeyevich demonstrated his technique of dealing with gunshot fractures in the lower extremities. I can still see him in my mind's eye as he stood at the operating table in a sterile smock with his sleeves rolled up, his hands inside rubber gloves. His fingers were long and slender like those of a concert pianist. While they were preparing the patient for the operation, Yudin showed us an operating table of his own design.

During the operation he was assisted by Maria Golikova, an experienced trained nurse, who had been with Yudin for many years and understood him without words.

Sergei Sergeyevich began by making a wide incision through the entry wound on the outer surface of the thigh. He followed that up by making another incision at the exit of the wound. Drawing the edges of the wound apart, he carefully cut away the dead tissue and washed out the dirt with a soap solution. Then he irrigated the



wound carefully and dried it with napkins. He sought to get rid of the tiny, barely visible, blood clots (a fertile breeding ground for microbes) as well as the damaged tissue.

When he reached the fractured part of the thigh bone Yudin slowed down a bit. He removed bone fragments that were hanging freely, while those that were attached to the bone with periosteum he put back into place and then turning round to face us said with some embarrassment: "This is the Achilles' heel of my method. I could, of course, use a radical technique here as with muscle excision. But then there would be an extensive defect in the bone and a good outcome would be unlikely."

The entry and exit of the wound, after resection of the muscle, looked like craters. Yudin made a counter-aperture at the back of the thigh to allow for a free outflow into the dressing. In conclusion, he powdered the wound with a lot of streptocide from a spray-gun of his own design that enabled the surgeon to direct a fine jet of powder into every "nook" of the wound, at the same time saving a lot of powder.

The operation was a success and while the nurse was putting a closed plaster cast on the thigh Sergei Sergeyevich asked us what we thought of his method. At first we refrained from comments and could not summon the courage to express our opinions freely. Needless to say, Yudin's method deserved careful study. But we had to proceed from the realities of war conditions. The main defect in the method was that even an experienced and fine surgeon like Sergei Sergeyevich took one and a half hours to complete the operation. Further, we had serious doubts about the desirability of making such an extensive excision of the muscle without getting rid of the damaged parts of the bone. The point was that bone fragments allowed to remain in a gunshot wound would provide "fuel" for subsequent infection. So the healing of the wound would be accompanied by the same complications as in the method accepted in all hospitals and would take just as long. Those were some of the things that ran in my mind when Yudin asked us for comments. But at the time we did not have the courage to tell him what we really thought.

As we left, Yudin presented us with a newly published war surgery manual in which he generalised the experience gained by military surgeons at different fronts as well as his own observations in dealing with wounds amassed during his many years at the Sklifosovsky Institute.

After the war I met Sergei Sergeyevich on many occasions and he was always full of plans and new ideas. Sklifosovsky Institute had

become a kind of Mecca for Soviet and foreign surgeons. They came there to watch the master surgeon in action, to participate in the analyses of cases and engage in heated debates on the problems and prospects of surgery.

Yudin's views on surgery and medical science in general were set out in his article published in *Vestnik khirurgii* (Surgery News) after his death, in 1961. The article summarises the reflections of an outstanding medical scientist. Taking issue with his opponents, Yudin argued that no scientific discovery could hope to live a long life. The static condition, he went on to say, far from being a feature of real science was in direct conflict with the very essence of it. Real science was in a constant search, and undergoing continued evolution. Yudin was opposed to a simplistic approach to the laws governing the development of living matter that tended to reduce that development to the physical and chemical reactions involved.

Yudin's views on the surgeon teacher's tasks are of considerable interest. With a characteristic touch of irony he wrote, "The surgeon lecturer shares many common features with an actor." At the same time he underscored the essential distinctions between an actor and surgeon lecturer, for the latter combines the roles of an actor, director and playwright. The surgeon acts out his role in the operating room and in the wards during his rounds. His image as a teacher largely depends on the way he comports himself when faced with an audience.

Yudin attached great importance to the emotional side of the surgeon's manner and his ability to engage in a polemic. In appropriate situations, Yudin said, even the "thunderbolts of righteous wrath" were in order.

Yudin was ruthless to those colleagues who tended to look upon their patients as just "cases" and were indifferent to human suffering. He pointed out that both students and general practitioners attending refresher courses in their particular fields would only admire a lecturer who during a discussion of case histories would show compassionate understanding of human suffering and equally his sincere joy at the victories of medical science. One of his other theses was that it was unpardonable to tell the students that everything was clear in surgery and that no mistake could be committed now that we have excellent technical equipment to rely upon in establishing a correct diagnosis or in determining whether an operation was indicated.

Sergei Sergeyevich himself was never afraid to discuss his own failures and mistakes at his lectures. What is important there is that such a brilliant diagnostician and profoundly observant

clinician did not consider it beneath himself to go into details of his own mistakes and mishaps even before a little experienced student audience, uninitiated into the "inner secrets" of surgery. He did this to enhance their interest in the matter being discussed and to warn them against similar mistakes.

I remember one lecture given by Yudin in which he told his audience how, during an operation for osteomyelitis in the shoulder bone, he accidentally cut the radial nerve. On another occasion he told his audience how he had nearly killed a woman patient by damaging a large vein in her neck and how, in his anxiety to prevent a catastrophic bleeding, cut her facial nerve. Yudin pointed out that one reason why he had committed that tragic mistake was that at one time he might have neglected his topographic anatomy.

Sergei Sergeyevich was fiercely opposed to idleness. His own capacity for work was astounding and his energy seemed inexhaustible. He spent days in the clinic operating, while at night he pored over his scientific papers.

Yudin's ideas of rest included visits to the theatre, art exhibitions and museums. He was also an inveterate hunter and angler. He was an avid reader of poetry and fiction. Sergei Sergeyevich was a true patriot and in love with his motherland. In his own words he was grateful to his country for the opportunity it gave him to follow his creative pursuits which alone gave meaning to his life.

In 1954 Sergei Sergeyevich died on a plane that was bringing him to Moscow from Kiev where he chaired a congress of surgeons. Sergei Yudin will be remembered by his colleagues as an outstanding scientist who added a brilliant page to the annals of Soviet medical science.

### **"Pan Doctor"**

We spent a brief two months in Poland where, acting in cooperation with units of the Polish army and supported by local partisans, our troops quickly mopped up pockets of enemy resistance in the eastern part of the country.

Hospitals were housed in fairly good premises. Polish women were our willing assistants helping the staff to look after the gravely wounded in the wards.

Perhaps at no other point in the history of relations between the Polish and Russian people had there been such warmth, respect and mutual understanding as there was in the days when Poland was being liberated from nazi oppression. Wherever Soviet troops

went they were given a warm welcome by the local population, who gave them every help, whether in launching pontoon bridges across rivers, or in repairing the bridges and railways blown up by the retreating enemy.

On Sundays local people, dressed in their Sunday best, went out for a stroll in the streets while older men and women went to church. Often one could see groups of people busy discussing their problems right in the streets. There was no lack of problems, beginning from where to obtain the daily bread and ending with the distribution of landlord lands.

For a while I was billeted in the house of an old Polish doctor. We made friends quickly and found lots of things to discuss. Before the First World War he had lived in Petrograd where he married. His Russian wife, a diminutive vivacious old woman, was happy to see her countrymen liberating Poland. Her heart was filled with pride for her motherland and for the victorious Soviet Army.

She told me that many of her friends and neighbours were looking at her with new eyes and some of them even congratulated her on the victory and expressed their gratitude as if it were she who had liberated them from the hated Germans.

Often the doctor's friends came to see him of an evening. They were a teacher from the local high school, a lawyer and the local priest. We would sit around the table and talk about the future Polish state, school education, the universities and inevitably the medical service.

The teacher said he found it difficult to believe that after all those years of suffering Poland had a bright future to look forward to. He said that he had seen many talented young people from poor families who were forced to work as farmhands in the factories instead of going to colleges and universities.

The priest understandably was interested in the status of the church. Was it true, he asked, that the Bolsheviki in the Soviet Union had closed all the churches and that church-going and religious instruction had been banned? I had to explain the actual position and allay his fears.

One late evening I received a summons from the Army Political Department. I arrived to find quite a gathering of my colleagues. We were instructed to give urgent medical assistance to the population of the newly liberated areas, especially to the people of Sedlec.

The town's hospital was overcrowded with wounded and sick people, adults and children, who did not have proper attention and care. The hospital's three doctors and a few nuns could not cope

with the mess of patients, food was scarce. Most of the patients were victims of nazi air raids. There were also those former inmates of local concentration camps recently liberated by the advancing Soviet troops. These suffered from a severe form of dystrophy. None of them ever complained of anything. They just lay still covered with blankets, withdrawn and utterly indifferent to the world. It was painful to see their sad sunken eyes and their emaciated bodies. Especially heart-breaking was the sight of wretched children.

We arrived in Sedlec complete with all our equipment, surgical instruments and medicines. We began by separating the wounded from the sick. Then we organised a sanitary screening service and, helped by local people, gave the sick a good bath and cut their hair. At the same time we set up operating and dressing rooms, a kitchen and a dining room for the walking patients. Our nurses wearing service tunics got a lot of willing help from the nuns with their long black dresses and snow-white headgear. They were very efficient and helpful. Among other things, they were very handy with wound dressing. Communication with the Poles was easy, our languages being quite similar.

R. I. Sharlai who spoke fluent Polish became very popular with the Polish patients, who addressed him as "Pan Doctor" and followed his advice and instructions to the letter. Sharlai made friends with the children, who took to following him about in the hope of drawing his attention or getting a sweet glucose pill from him.

Within three days of our arrival the town hospital was transformed beyond recognition. The wards and the various departments shone with ideal cleanliness and order. The wounded and the sick had clean linen, were bandaged up carefully, well-groomed and, most important of all, well fed.

We made many friendships with the Polish members of staff, both doctors and junior medical personnel. Even the nuns, who at first were rather cold and distant, visibly relaxed and no longer avoided conversation.

The Mother Superior, who was a very efficient leader of her sisters, confessed that godless though we were we nevertheless acted in accordance with Christ's teaching. Coming from her that must have been the highest praise.

At the end of two weeks we received orders to rejoin the army which was being transferred to the combat zone of the Third Byelorussian Front.

## IV. VICTORY

*Nur der verdient sich Freieheit wie das  
Leben,  
Der täglich sie erobern muss!*

*Goethe, "Faust"*

### In East Prussia

In the winter of 1945, troops of the Third Byelorussian Front to which the 28th Army was assigned were locked in heavy fighting in East Prussia. The nazi command had pinned great hopes on the impregnability of their defences in this strategically important area.

The Soviet forces had to crash through a series of enemy defence lines. Between the rivers Niemen and Dieme, a stretch of some 100 kilometres, the enemy had built staggered rows of formidable gun and heavy machine-gun emplacements with reinforced concrete walls, two to three metres thick. The approaches were protected by several rows of barbed wire in addition to anti-tank trenches and minefields. The towns and rural communities were turned into strongpoints, while the many rivers, streams, lakes, canals and dense forests provided additional natural obstacles to the advancing Soviet troops.

Full-scale fighting got under way in central East Prussia when Soviet forces swung into action in late January 1945. Before long they had taken several towns and pressed the enemy hard against the Friesches-Gaff, south-west of Königsberg. This was followed by operations to annihilate an enemy grouping in and around the city of Heiligenbeil. Enemy resistance was particularly fierce in this area. By concentrating impressive forces on a limited sector of the front the nazi command sought to create a reliable road-block to the advancing Soviet Army making it possible for the rest of their forces to escape into the Friesche-Nerung spit for a subsequent evacuation of at least part of their manpower and equipment.

However the pressure of the advancing Soviet forces was irresistible, and on March 25 the town fell. Soviet troops swept beyond it to attack the nazi divisions on the Friesche-Nerung spit. This was where the enemy concentrated masses of tanks, artillery pieces and vehicles of every description. Using this impressive

materiel the enemy made desperate attempts to break the encirclement but to no avail. The end came on March 29 when the whole of the enemy grouping south-west of Königsberg was completely wiped out.

On April 6 Soviet forces began storming Königsberg. After three days of heavy fighting the garrison of the fortress-city was routed. Thus, East Prussia, that hornets' nest of German aggression, was rendered harmless once and for all.

The 28th Army, which took an active part in the offensive, met desperate resistance at Humbinnen and Eidkunnen. Most of the wounded brought to our medical aid stations had bullet wounds. The enemy troops made skillful use of brick-built houses for aimed submachine and machine-gun fire. House-to-house fighting cost the Soviet troops dearly.

"It's not fair, doctor," complained a moustached elderly soldier to a woman doctor, "it's not fair, I tell you. I've covered all the way from Stalingrad to this place here and didn't have so much as a scratch. And now this bit of unpleasantness right at the end of the war, and you say I'd have to stay at the hospital. Do you think you could put me right in a week's time, doctor?"



A group of Army Surgeons headed by Chief Surgeon of the 3rd Byelorussian Front Professor S. I. Banaitis (third from right)

“No, dear, I am afraid it’ll take much longer than that,” she replied. “You see, your left shoulder-bone is broken and there is a nasty wound in one of your legs. Looks as if they’ll have to finish the war without you.”

...Our hospitals and medical aid stations were housed in school and administrative buildings while the regimental medical posts were camped on the outskirts of villages and country towns around which fighting was still going on. The personnel of the regimental medical posts dressed wounds, brought the wounded out of shock, put splints on broken extremities and then sent the wounded on to field hospitals.

One day Sharlai and I decided to visit the medical aid station of the 48th Division. At divisional headquarters we were told that the station was camped in at the edge of a pine wood some 15 kilometres from headquarters. However, when we reached the wood we found no one at the edge. We wandered about the wood for some time until we came across several rows of tents in its very depth. Apparently, enemy troops, desperately trying to break through our lines, had discovered the medical aid station and opened fire on it. The medical officer in charge had to evacuate in double quick time into the safety of the wood.

Most of the wounded had been attended to and were ready for evacuation to second-echelon field hospitals. A few casualties with abdominal wounds were still waiting to be operated on. The head surgeon had been standing at the operating table for thirty-six hours and was on his last legs. I took over, and he went to the hospital tents to have a look at the gravely wounded there.

I worked non-stop until the early hours of the next morning when I had operated on the last soldier. Other surgeons were just as busy.

While our troops were “eating” into the heavily fortified enemy defence lines, distributed in depth, the medical aid stations and field hospitals were separated by a mere two to three kilometres. But whenever our troops poured into the breaches made in the enemy defences and swept forward, the distance separating regimental medical posts and divisional medical aid stations as well as between the latter and second-echelon hospitals increased considerably.

Just now the medical aid stations and field hospitals were deployed in the immediate vicinity of the front-line. The wounded were quickly attended to and evacuated to front hospitals.



Some of the hospitals were dismantled and on the way to other locations, but their surgical teams continued to operate. Some of the wounded were brought in on army vehicles moving into the rear. Whenever they came upon a hospital the drivers stopped and turned over the wounded without asking whether the hospital was fully deployed or not. In this situation the head doctors at the dismantled hospitals issued instructions to their personnel to stand by round the clock. Long experience had taught them to read the tactical situation well and act quickly and with dispatch. Incidentally, the heads of front-line hospitals all through the war were rarely shifted around, and Head of the Army Medical Department regarded them as his mainstay. He prized them highly and was reluctant to let anyone go.

During lulls in the fighting, Head of the Army Medical Department did not hesitate to draw the head doctors of field hospitals over the coals for their slightest oversight, but when fighting was resumed he gave them every help.

The personnel of medical posts and field hospitals sometimes found themselves in really tight spots, but invariably acted with courage and resourcefulness, often performing feats on a par with the fighting men. Here is one example.

Major Kern of the Medical Corps, head doctor of field hospital No. 5032, reported to A. M. Tarasenko, Head of the Army Medical Department, on the exploit of three of his nurses. He had detailed the girls to bring some straw for the mattresses. The straw stacks stood in a field next to a deserted farm building some five kilometres from the hospital. When the nurses began loading the straw onto a lorry they discovered a German soldier who had burrowed himself into a straw stack. When he saw that it was only girls he produced a knife and lunged at them. The girls kept their heads and using the butts of their submachine-guns knocked him off his feet, bound him hand and foot and chucked him into the lorry. Later they discovered two other German soldiers who had likewise hidden themselves in the straw and took them prisoner as well.

Returning to base they were shot at and had to fight off the attackers with submachine-gun fire. The girls reached the hospital safe and sound and proudly produced their "trophies". Soon afterwards Lieutenant-General Luchinsky, commander of our army, decorated the brave girls with war medals "For Valour".

...The towns and country estates taken by our forces were practically deserted. The SS troops had apparently frightened the inhabitants into fleeing with them leaving their cattle and chattels

behind. I remember driving with Sharlai along a deserted country road past empty houses and farm buildings. All around us we could see groups of cows, pigs and poultry wandering about desolately and searching for food. The cows were mooing and looking about in anxiety—there was no one to milk them....

The head of the hospital stationed in Humbinnen was happy to see us although a tragic accident had just occurred at his hospital. This is what happened. The retreating nazi troops had apparently assumed that the town's hospital building would be used by the Soviet forces as a field hospital. So, they mined the place. The head doctor asked sappers and bomb disposal experts to take a good look at the place. They discovered several delayed action mines, collected them and stacked them in the courtyard.

“While we were busy sorting out our equipment,” the doctor Shakhnazarov told us, “putting beds into the wards and making the usual preparations, the leader of the bomb disposal team, a second lieutenant, kept warning the girls not to come anywhere near the mines. He reproached me for rushing things because, he argued, if one of those things goes off, God forbid, the hospital would be blown to smithereens. Finally, a horse-drawn cart, driven by two sappers, arrived to take the mines away. I said goodbye to the lieutenant and went into the building. As I left him I heard him giving instructions to his men and cracking some joke. Seconds later a terrific explosion rocked the building to its foundations. I was blown off my feet and fell to the ground, flying glass and pieces of plaster showering over me. When I recovered and climbed to my feet to look around I saw neither the lieutenant nor his men nor the cart with the horse.... Apparently one of the delayed action mines went off spontaneously.”

An absurd and unfair death. How many there were during the war years.

Having ascertained the hospital's needs we made the rounds of the medical aid stations in the neighbourhood. We drove slowly through the narrow crooked streets of Humbinnen. The air was heavy with the smell of burning, street fighting kept flaring up here and there. Nazi death squads ensconced themselves in the attics of the buildings still standing kept pouring the streets with machine-gun fire. Our troops had to comb house after house, block after block. The going was really tough and the losses heavy.

I remember an incident when a wounded SS officer was brought to one of our medical aid stations. The doctor wanted to examine him. The SS officer tore off the bandages, produced a knife and

made a lunge at the doctor. Luckily for the latter, the nazi beast was too weak, lost consciousness at the last second and slumped on the floor.

...Hilter was throwing his last reserves into the fray. There was increasing evidence of youngsters and elderly people, veterans of the First World War. After an artillery bombardment or a good volley of Katyushas they panicked and scattered hiding in basements and attics. There were very few experienced and seasoned soldiers left among the German forces, such as had begun the war at Warsaw or Dunkirk and later were transferred to the Eastern Front. Most of them had found their death in the boundless stretches of Russia.

Meanwhile the Soviet Army rolled inexorably on, crushing enemy resistance. The roads along which the nazi forces retreated were cluttered with masses of heavy equipment, crippled tanks, lorries, food depots and ammunition dumps. It was impossible for the Germans to move all this to rear areas, most of the escape routes into Germany having been cut by Soviet forces.

### **Fascism's Terrible Trail**

Soon we reached Domnau where we set up our base camp. This small country town buried in verdure with its peaked tiled roofs was the epitome of cosiness and comfort. Little did we know when we arrived that here, too, German fascism had left its terrible trail....

In the outskirts of Domnau was a concentration camp disguised as a hospital. Nearly 700 POWs from the Soviet Union, France, Belgium, Italy and Poland had been languishing in nazi captivity there. The camp was guarded by SS troops. The inmates were tortured and put through every form of humiliation. The SS guards set dogs on them. Those of the inmates who were in a bad shape were brutally put to death. Needless to say, there was no medical service of any kind whatsoever.

Soviet POWs were treated the harshest. They lived in separate barracks and their day rations consisted of a bowl of foul-smelling beetroot-slops and a tiny piece of bread mixed with sawdust. Emaciated, wounded and sick, they were condemned to inevitable "liquidation".

When we visited the camp soon after it had been liberated, its gates were wide open. Those who had been lucky to survive could walk to freedom. Special services were set up to look after the former inmates and supply them with clothing and food. We

witnessed exceedingly moving scenes when members of that multinational community of former POWs said goodbye to go their different ways. The Frenchmen, the Poles, the Italians, who had survived the nazi hell, thanked their Soviet liberators with tears running down their faces.

The concentration camp at Domnau left an indelible imprint on our minds. The nazi regime had perverted and corrupted the very notion of a physician, who is called upon to help his fellow-men when ill or suffering from physical pain or mental anguish. The nazi doctor was often a refined torturer and sadist who experimented on human beings. Witness the horrible experiments staged by nazi executioners in white coats on the inmates of Dahau, Auswitz and Buchenwald....

The nazi doctors tried on the prisoners their latest psychotropic drugs designed to break down the patients psychologically and a variety of toxic agents and poisonous substances. Experiments were staged to find the effect of ice-cold water on the human body. People were put in ice-cold water and left there until they passed out. Most of them died when their body temperature was brought down to 25-26 degrees Centigrade. Those who survived this inhuman experiment were later used in testing the effectiveness of various methods of bringing them round. In cold blood nazi doctors inoculated POWs with cultures of typhoid fever and exanthematous typhus. They were deliberately infected with malaria and used as guinea pigs in experiments designed to follow the successive stages of the disease and the circumstances of the final death.

Those guilty of these inhuman experiments must be given no quarter ever.

### The Major Everybody Knew and Loved

Another hard day's work at the field hospital came to an end. Outside, a cold drizzle was falling. A few days before I had learned that the 48th Guards Army was operating next to ours. The army surgeon there was I. M. Papavyan, a colleague of mine with whom I had worked side by side back in Burdenko's clinic. I had not seen the man since 1943. One day I decided to invite him to my hospital but there was one problem—I did not have a single bottle of wine left. I complained to Sharlai about the sad situation. Sharlai smiled and said that something could be done about that.

“What do you mean?”

"Just what I said," smiled Roman Ivanovich. "Why don't you send for Major Shleimovich and start talking to him about his beloved Odessa. I'm sure it'll work."

I took the hint and did as Sharlai advised. Major Shleimovich who looked after the medical supplies had considerably replenished the stocks of medicines and dressing material during the advance. We also knew that, among other things, his men salvaged from the enemy several crates of French cognac and all sorts of tinned goods. The problem was to cajole him into parting with some of them.

When Major Shleimovich turned up I got working on him. Shleimovich, short of stature but well built, was a most likeable fellow. As we sat talking happily about his native Odessa he removed his specs and started rubbing his glasses with a handkerchief. Suddenly, as if divining what I was getting at, he said, "Now come, you people are so badly off. Haven't the salvage teams looked after you at all?" I replied that we had no direct contact with the salvage teams while Major Shleimovich was known to be so close-fisted that, as rumour had it, it was impossible to get a handful of snow out of him in the middle of winter.

"I'm not that mean," replied Shleimovich offendedly. "After all the war is at an end and we could do with a bit of celebrating. Why don't you send one of your men to the stores. I'll let him take what he likes and as much as he can carry."

"You are probably going to ask me next," continued Shleimovich, "how I managed to keep the medical corps supplied with everything necessary. Just between you and me, let me tell you, it hasn't been all that hard. After all, the regimental medical aid stations looked after themselves very competently. I can assure you there was not much left for me to do."

When Shleimovich left, Sharlai gave a laugh and said, "He's a remarkable man. He makes everything sound so simple, but in fact he will go to the ends of the earth to get what is needed."

Indeed, Major Shleimovich was famous as a determined busy-body. He thought nothing of going to medical aid stations or even to the trenches. He saw it as his duty to personally check that the medical services in his charge were adequately supplied with everything they needed. Sometimes Head of the Army Medical Department, seeing this, would remind him that his job was confined to supplies only. To which Shleimovich replied that it was also his job to make sure that the boys in the trenches had everything they needed at all times, whether during attack or when defending. Shleimovich was so popular that everyone was only too

glad to offer him a lift during his travels to the front-line. Another reason he was such a welcome fellow-traveller was that Shleimovich could be depended upon to have a spare pack of cigarettes (although he was a non-smoker) and was a great joke-teller. Most of the jokes were inevitably derived from his home city of Odessa.

It was a mystery to us how Shleimovich, practically single-handed, was nevertheless able to work out exactly the amount of, say, dressing material that would be necessary for a particular military operation. There was not a single case when Shleimovich was off in his calculations. He knew by heart what kind of medical property a particular battalion, regiment or division had available and how much more would be required. It was a waste of time to argue with him, let alone try to obtain a little extra.

Shleimovich worked literally day and night. I often saw him sitting at his desk, cluttered up with heaps of papers, documents and what not, in the dead of night when everybody else was fast asleep. Whenever Sharlai and I returned from our rounds to our base camp late at night and saw only one window still lit-up, we knew it was Shleimovich's. He could be depended upon to offer you hot tea from a thermos or the inevitable front-line soldiers' soup. We would eat heartily, but whenever we invited Shleimovich to share in our late supper, he would grumble about people who gave no peace to themselves or others. Would we please get done as soon as possible and go to bed giving him a chance to return to his desk because he had to have calculations and orders ready to forward them to the Front Medical Directorate first thing in the morning.

One day Shleimovich, on learning that I was sending a package home by someone, came to see me and handed me a food parcel.

"Listen, why don't you send this to your kids? I am not much of an eater, you know, and here is always something left over from my rations."

Knowing that any arguing with Shleimovich was a waste of time, I accepted the gift. It was his custom to share his food rations with his friends. He had had no news about his own family since the early months of the war. When Odessa was liberated, he wrote to his friends and made official inquiries about their whereabouts but to no avail. We were all sincerely sorry for this kindhearted man.

But to return to my story. That evening, when Papavyan visited me in my hospital, we had quite a crowd. Everyone who was off duty dropped in including some of the trainee-doctors from the Military Medical Academy. The party went on into the early hours

of the next morning with jokes, songs and endless reminiscences. That was how our last night in East Prussia passed off. The next morning we packed our things, embarked on the waiting lorries and set out on the long journey into the heart of Germany.

### **The Last Battles**

By mid April 1945, Soviet forces had taken up the positions for the final attack on Berlin.

Meanwhile pockets of enemy resistance where panic-stricken nazi troops desperately tried to break out of encirclement remained in the rear of our advancing Army.

Those days were marked by a tremendous enthusiasm among the Soviet forces. They were looking forward to the final victory that everyone felt was quite near. No one paid much attention to the scattered and demoralised groups of nazies in the rear. We all knew that their fate was sealed.

Indeed, pockets of resistance like the ones near Elbing, Danzig, and Graudents could not influence future events in any appreciable way. Nonetheless they sometimes caused bad trouble, particularly when the well-equipped nazi desperados attempting to break out of encirclement came upon our logistical establishments, hospitals, depots, stores, shops and post offices.

One day we halted in a small country town. In the middle of the night we were roused by a battle alarm. Still bleary from sleep, it was some time before we realised what was afoot. It appeared that a big body of nazi troops complete with tanks and artillery which had burst out of encirclement were advancing on us.

General Tsybin's wife Alexandra Dmitriyevna deserves every praise for her presence of mind. It was largely thanks to the vigorous actions of this brave and energetic woman that the medical services broke camp with the least delay and started towards our army's first echelon. It was done in the nick of time, too. No sooner had our lorries left the town than bombardment began. We had barely time to escape. Unfortunately, some personnel members were less lucky and paid with their lives for their tardiness.

Once in safety, we thanked Alexandra Dmitriyevna for her presence of mind and efficiency in evacuating the medical services. The woman had gained experience in things military during her years with the army in the field. On several previous occasions Alexandra Dmitriyevna had found herself under shell fire and bombing and she invariably kept her head and acted quickly and with determination. Alexandra Dmitriyevna had her

fifteen-year old son with her throughout the war. Slava had become so used to army life that he was able to sleep in all sorts of situations quite undisturbed by the rumble of artillery. The soldiers had taught him to handle a pistol and drive a car. During lulls in the fighting Slava often came to see us and we, remembering our own children, were delighted to give him a game of chess or tell him stories about our experiences at the front.

...We were still pressing on towards Berlin when one of the advance corps of the 28th Army engaged the enemy on the outskirts of the German capital.

Our medical aid stations were deployed in close vicinity to the battle zone. A short distance behind them were a few field hospitals ready for action, with more waiting until such time as the main body of the army made contact with the enemy.

Our army's Medical Department pitched camp at Blankenfeld about 20 km from Berlin. Next to us was a German field hospital just taken by our troops. Colonel Tarasenko, Head of the Army Medical Department, detailed me to make a tour of the German hospital and examine the wounded there. "For all we know," he said, "some nazis may have disguised themselves as patients".

Sharlai decided to accompany me, just in case, he said. Half an hour later he arrived at the hospital to find a lonely sentry at the gate. There was not a soul around. The hospital building appeared deserted. The sentry, however, told us that a captain from the army intelligence department had just gone inside. As we walked up the porch-step we heard a pistol shot go off and dashed into the vestibule. The captain white as a sheet, one of his arms hanging limply, sprang out of an open door. As I applied an improvised tourniquet made of my handkerchief just above the wound he muttered angrily, "The bastard. I should have finished him there and then, of course, but I couldn't. His legs are torn off."

A second later an elderly German in the uniform of a medical officer came running to us. He was the head doctor. Shaking all over he explained in halting Russian that the wounded Germans were unaware that the hospital was in the zone overrun by Soviet troops and that was why this tragic incident had happened. When the legless SS officer saw a Soviet captain he snatched his Walther from under the pillow and pulled the trigger. Fortunately, the bullet went clean through the soft tissues of the captain's left shoulder without touching the bone. We went into the hospital's operating room where I treated the wound and applied an antiseptic dressing.



Together with Roman Ivanovich the intelligence captain gave a briefing to the German head doctor adding sternly that it was his duty to warn the personnel and the patients of the full consequences that would follow any further provocation on their part. Later, accompanied by some of the staff we went round the hospital. Once inside a ward and examining the patients, I quite forgot about the need for caution and went about my usual work. Sharlai, however, throughout the proceedings stood close to me keeping a sharp lookout. Under his white coat he had a revolver at the ready. So we went from ward to ward until we were satisfied that there was no one in the hospital who had no business to be there. After instructing the head doctor to report to our HQ the next morning, we left.

Back at the Medical Department Tarasenko told me to leave immediately for the Front HQ to make arrangements for the evacuation of our wounded and report to Professor Akhutin, Head Surgeon of the First Ukrainian Front. Professor Akhutin was a well-known war surgeon and an eminent scientist. I was familiar with some of his scientific papers and understandably looked forward to meeting the man in the flesh.

Akhutin began his career as a war surgeon during the campaigns at Khalkhin-Gol and on Lake Hasan. Afterwards he had several articles published in various medical journals on the experience of providing surgical aid under front-line conditions. He was an acknowledged expert on war surgery and much of what he said was a revelation to us then. Many of his recommendations and ideas formed the basis of standing instructions issued for the guidance of the surgical service supporting the army in the field.

I was accompanied by Colonel D. P. Barsukov, Chief of Staff, and a liaison officer. The colonel invited me to get in beside him in the Mercedes. My driver, however, objected saying that he was responsible for me and therefore I must go in his jeep. The colonel became quite annoyed, and so I climbed into his Mercedes. After driving about 60 kilometres we heard the insistent honking of the jeep behind us. The colonel told his driver to stop. Ivan Mikhailovich, my driver, came running to us panting, and reported that the jeep was ready and waiting for me. Colonel Barsukov lost his temper and said, "Very well, Lieutenant-Colonel, get out of my car. Your guardian angel doesn't think a Mercedes is good enough for you."

I did as I was told and, as we started, reprimanded Ivan Mikhailovich for his lack of tact. He kept saying that he was responsible for me. The colonel's driver was young and

inexperienced, he said, and anything could happen, you never know. Frankly, I was disarmed by this rather touching show of solicitude for my welfare. During this exchange we did not notice that we had dropped behind the Mercedes. Ivan Mikhailovich stepped on the gas. We were already in sight of the colonel's car when suddenly we heard the rattle of heavy machine-gun fire. The next moment the Mercedes swerved off the road, overturned and slid into the ditch. We stopped and dashed towards the car. Helped by soldiers, we turned the Mercedes upright and dragged out the colonel, the liaison officer and the driver. They were all beyond my help: the machine-gun burst had finished them all off. We learned later that the firing had been done by a group of nazi troops who had apparently been wandering about. Our caps off, we stood in silence over three bodies. Three more senseless deaths.

I did the final leg of the journey by plane as the highway was cut in several places by roaming nazi units.

At the Front HQ I was received by Professor M. N. Akhutin, now Lieutenant-General of the Medical Corps. The war years, with their continual bivouacking and countless operations he had to perform on different sectors of the front, had visibly aged Mikhail Nikiforovich. He no longer looked his spruce and healthy self that I remembered from before the war. His wife, a soft-spoken and considerate woman, was with him.

We met like old friends. After reporting on the situation in the army I told him about the problems and difficulties we encountered when evacuating the wounded. We were in a zone of heavy fighting. The situation was in a state of flux, and the medical services' speed and efficiency were important as never before. Professor Akhutin, for his part, emphasised the organisation of specialised medical aid and the need to supply field hospitals with specialists in narrow fields and the necessary equipment. He stressed that no other army in the world had as many highly qualified doctors and specialists as the Soviet Army.

We spent the rest of the evening recalling interesting episodes from our work in front-line hospitals. We sat chatting well into the night. The next morning I returned to Blankenfeld.

The storming of Berlin began in the last days of April. The Germans had fortified the city well in advance, building three defence lines around it. Some of the 400 formidable reinforced concrete gun emplacements, pill boxes and bunkers reached underground down to 60 feet. Such a stronghold could house a whole regiment. All told, Berlin was defended by over 300,000

troops of all arms, including SS, Volkssturm, members of the "Hitlerjugend", in addition to 32,000 policemen. The nazi Command were doing their damndest in an attempt to stave off the hour of reckoning.

Berlin in those days was a scene of fierce fighting. The centre and eastern city blocks had been turned into heaps of rubble by allied air raids. Our 28th Army, which was now part of the First Ukrainian Front, was slowly edging its way towards the Imperial Chancellery. And at last the red flag of victory was hoisted over the Reichstag.

Colonel Tarasenko and I were driving in city districts recently overrun by our troops. All around us we saw mountains of broken brick and the charred shells of what were once buildings.

When we reached the Reichstag, we saw a group of senior officers of the German medical corps being led out of their hideout in its bomb-proof basements. Their eyes downcast, they walked slowly past us. Lifting their glances momentarily, they stared bleakly at the ruins around. The divisional doctor who accompanied them chucked into my car a leather bag with a red cross and "Reichstag" inscribed on it. For a long time afterwards I kept the bag as a memento.

Later that night, when we heard the news that the German High Command had signed the act of unconditional surrender, the sky over Berlin was lit up by rockets and the heavy silence broken by volleys of small arms fire. Those were the final shots of the war, the soldiers' victory salute. The Soviet troops' westward march, which had begun at Stalingrad, had ended triumphantly in Berlin.

The first days of peace stunned one with their silence and quiet and with the novelty of everything. To this day I can see quite vividly, in my mind's eye, a platoon cook ladling out Russian soup and buckwheat gruel to the German women and children crowding around a field kitchen. Harboursing vengeful hatred is not in the Russian character, and once the guns of war fall silent the Russian soldier forgets about his own tragedy at home and shows mercy to children, old men and widows of the enemy country.

The nightmare of war was now a thing of the past. But our memories kept taking us back to the war years with the sleepless nights spent at the operating table, the groans of the wounded, the thunder of guns, and the front-line roads. I can recall the faces of my friends and colleagues with whom I had gone through the war and many of whom were no longer with us.

I remembered the first war winter in snow-blanketed Kazan. The endless stream of wounded men coming from Moscow, Tula, Volokolamsk. The endless operations.

The battle of Stalingrad.... Our mobile hospital following in the wake of the 5th Shock Army that was moving out to intercept Fieldmarshal Mainstein's panzer group.... The roads cluttered up with torn vehicles and charred nazi tanks with the swastika on their sides, the ruins and the columns of German prisoners.

The spring of 1943. The Soviet forces had gone quite a long way from Stalingrad where the Soviet soldier performed a feat of arms that turned the tide of war.... I was getting used to my new job as Army Surgeon which brought new duties and concerns. The next day I was due at the neighbouring Guards division. To perform operations and more operations.

I remembered the swamps and dense forests of Byelorussia and her towns and villages razed to the ground by the nazis. I remembered the warm welcome and loud cheering given the Soviet liberation troops by the people of Poland. I remembered the heavy fighting in East Prussia.... And now we were in Berlin.

We, the soldiers in white coats, had covered thousands of kilometres along the roads of war together with our combat forces. Everywhere, in the blizzard-swept fields near Moscow in the winter of 1941, amid the ruins of Stalingrad in 1942, along the impassable muddy roads of the Ukraine in the spring of 1944 and in the quagmires and swamps of Byelorussia, our Medical Corps had followed in the wake of the combat troops.

Our victory over nazi Germany was hard won indeed. The martial work of the Soviet soldier was, without exaggeration, titanic. But those who provided the necessary arms and equipment for the men on the battlefield, those who had worked selflessly in the country's interior, suffering privations and overcoming the grief of bereavements, also had a part in bringing victory near.

In his book *The Soldier's Duty* Marshal Rokossovsky spoke highly of the Soviet medical services in the last war. He wrote, "It would not be an exaggeration to say that members of the medical corps distinguished themselves as veritable heroes. They did everything in their power to put the wounded back on their feet, enabling many of them to rejoin the combat forces. The men and women of the medical corps have earned our deepest gratitude for their kindness and solicitude, for their contribution to the country's war effort."

It is not for me to judge how full a picture I have been able to draw of the Army Surgeon's role as a military organiser. One thing

is certain, his role is no mean one. To be able to discharge his many different duties the Army Surgeon must have a good knowledge of the organisation and tactics of the medical services, must be familiar with the ABC of military science quite apart from being an expert in his own particular field of medicine.

How little we knew about medical field work, when leaving for the front-lines at the start of the war. This created many difficulties in the beginning. Gradually we gained a wealth of experience, the value of which is inestimable.

Even while the war was on, efforts were made to generalise this experience. During lulls at the front the medical service began to analyse the experience gained in the recent fighting. The statistical data relating to surgical work, coupled with the impressions of those directly involved in concrete situations, served to provide rich food for thought and reflection and helped to improve medical attendance and evacuation facilities. That was the reason why the 28th Army's Department used every opportunity to organise wide-ranging discussion of the experience gained by the medical services at army and divisional level conferences. On repeated occasions I reported on our work at Front conferences.

Soviet medical scientists worked no less fruitfully during the war years than practising doctors. Despite the many problems and difficulties, they continued to perfect techniques and methods of surgical treatment of the wounded. The organisational restructuring of the medical service, carried out on the eve of the war, was another major contributing factor to the later success.

A unified war surgery doctrine provided a basis for the system of stage treatment of the wounded and the sick implemented during the war. For the first time in the history of war, surgical assistance at all stages was standardised. Unified principles of surgical treatment in the battle zone were worked out and put into effect. The same went for the provision of specialised aid on the army and front levels. The efficient organisation of on-the-spot specialised assistance enabled us to save thousands of gravely wounded soldiers. A very important part was played by the field hospitals for the lightly wounded. The use of surgical methods made it possible to put the soldiers quickly back on their feet and return them to combat duty. Thanks to the efforts of the Soviet medical service 72.5 per cent of all wounded and 90 per cent of all sick servicemen were eventually able to return to the ranks. No other army in the world can boast of such a splendid record. The Soviet medical profession can take a legitimate pride in their achievement.

In his foreword to *The Surgeon's Diary* by A. A. Vishnevsky, Marshal Zhukov wrote as follows, "In a major war, victory over the enemy depends to a large extent on the quality of the medical service, particularly on the quality and efficiency of war surgeons." The entire experience of the last war brings out the validity of this statement.

It was not only the medical services of the armed forces that looked after the sick and the wounded during the war. They were helped by the health institutions deep in the country's interior, and by thousands upon thousands of voluntary workers. The mothers, wives, brothers and sisters of soldiers at the front had to put in 10 to 12 hours a day in industry and agriculture, and still they found the time and strength to look after the wounded in hospitals. Going without the most essential goods, Soviet women gave their last, including their blood, to ensure the speedy recovery of the wounded soldiers. Even while the war was on, a far-flung network of research centres, specialised hospitals and polyclinics for war invalids was set up. The invalids were given the treatment, provided with artificial limbs, and orthopaedic footwear, got free accommodation at sanatoria in the country's best health resort areas. The state assigned the war invalids good pensions and set up specialised vocational training centres which enabled many of them to eventually return to an active life.

To promote the further development of Soviet medicine the Soviet government decided to set up an Academy of Medical Sciences. At the inauguration session, held in late December 1944, Nikolai Burdenko, Chief Surgeon of the Soviet Army, a Hero of Socialist Labour and deputy to the Supreme Soviet of the USSR, was unanimously elected its first president. Burdenko, who was among the sponsors of the academy, attached to it great political importance, apart from the obvious scientific importance. In his concluding remarks at the session he said, "We are witnessing the laying of the foundation of an edifice of great historic importance. Firstly, the Academy of Medical Sciences is being founded during the Great Patriotic War. Its importance should be seen not only in a scientific but also in a political context. The academy is a component of the Soviet state. Its creation testifies to the Soviet people's awareness of their strength and their unshakable faith in ultimate victory over nazism. Secondly, we will be the custodians of the historic legacy handed down to us by the great founders of Russian medical science—Pirogov, Sechenov and Botkin, who demonstrated to the world the enormous potential of the Russian people."

# THE DAYS OF PEACE

## I. BACK HOME

*Science is perhaps the most reliable and trustworthy bulwark in the vagaries of life.*

*K. A. Timiryazev*

The first weeks of peace.... Day and night masses of people were travelling across the huge country in different directions by every available means, train, lorry, and what not. Front-line soldiers were returning home, civilian evacuees were going back to their home towns and villages. Mothers with their children would be going from the East to their home in Leningrad, Minsk, or Kiev, while from the West soldiers, their husbands would be hurrying home from Vienna, Berlin or Budapest.

In the first post-war weeks, railway stations and junctions up and down the Soviet Union were scenes of moving reunions as former front-line soldiers met their near and dear ones. A lorry would come down a country road carrying soldiers returning home. Without waiting for the driver to stop a soldier would jump down on the roadside, wave goodbye to the others and make for his home, his bleached service tunic, bespangled with war medals. There were tears of joy, kisses, embraces and handshakes awaiting him at home.

I witnessed many reunions as I made my way home all the way from Berlin to Moscow, hitch-hiking most of the time together with other officers and rankers returning home after demobilisation.

I reached home early in the morning. My children knew I was coming and were expecting me any day. At last we were together

again. It is impossible to put into words the feelings that overwhelmed me. It was not until I found myself among my near and dear ones that I fully realised that peace had come.

The children had grown and I hardly recognised them. My wife and father had aged quite a bit. Their faces were haggard and drawn, and their eyes seemed sterner.

My wife had a hard time of it during the war years. In the village where she had been evacuated, she worked more or less round the clock in the local hospital, examining outpatients and visiting the seriously sick in the neighbouring villages. When a military hospital was opened nearby, my wife was mobilised and put in charge of its surgical department. The flow of wounded soldiers seemed endless. At night, when she reached home after a hard day's work, she felt more dead than alive. And there were the house chores waiting to be done. She had three children, her elderly mother and my sick father to look after. My father suffered from chronic purulent pleurisy and was in pretty bad shape. All of them



The author's wife Klavdia Andreyevna K o v a n o v a with her mother and children. During the war she worked at the evacuation hospital in Buturlino village, Gorky Region



had to be fed and clad. On top of it all in the late winter of 1943 my wife contracted typhus in the village of Urgu where she had gone to deal with an outbreak of epidemic there. She survived but by a miracle. I only learned all that when I visited them while on short home leave. My wife had just been discharged from hospital and was as thin as a rake and extremely weak. Her face was bluish white and she looked like a teenager with her hair shaven off and her thin neck barely able to support her head. She could hardly walk even when leaning on a walking stick. She came out to meet me, supporting herself on a stick, wearing an old worn-out coat on and felt boots from different pairs. When she recognised me she slumped on my chest and passed out....

The hurricane of war had left its trail of terrible devastation and human suffering deep in the country's interior, as well as the war zones.

Now that the war was over, we got down to work to remove its consequences. The medical profession had its share of problems. Among them was generalising the experience gained in the war years, especially, in wound treatment. It was essential to make a thorough study of the most rational methods of administering medicines to injured organs and tissues we had been using empirically in our field hospitals.

It was important, for instance, to determine why a ligature of a major artery damaged in one place yielded negative results and the results were positive in another. We had thought that the arteries inside a limb should be ligated as close to the wound as possible, but experience showed that very often the extremity became necrotised as the result, necessitating an amputation.

Another problem was the possibility of suturing the damaged section of an artery. During the war all our attempts to suture an artery ended in failure. The wound suppurated, the sutures came unstuck and a serious secondary haemorrhage resulted. Apparently, we had to look for the reason for our failure not so much in the faulty suturing technique but in changing conditions under which the suturing was done.

A stumbling block for surgeons during the war had been septic conditions resulting in pockets of suppuration. Many of our patients died because of our failure to find the exact location of the pus pocket and open it in the right place. Burdenko, Vishnevsky, Voino-Yasenetsky, Herzen and Yudin had won universal recognition not only for their skill as surgeons, but also for their intimate knowledge of human anatomy that enabled them to foresee possible complications resulting from a grave injury.

Voino-Yasenetsky was famous for his astounding knowledge of topographical anatomy. Soon after the war he published his *Studies in Purulent Surgery* which was awarded a State Prize.

A. V. Vishnevsky told me soon after the end of the war that it was essential to initiate in-depth research into the surgical anatomy of fascia and cellular interspaces. These played a prime role in the development and spread of purulent infection. "You have gained experience and knowledge during the war years, Vladimir," he urged me, "and you did a post-graduate course in topographical anatomy. You're the right man for the job." (I did not suspect at the time, that the conversation would have far-reaching consequences.)

In the immediate post-war years there were masses of people wanting plastic surgery, particularly on the face, head and extremities. There was no end of work for surgeons in this field. It pained us to see some of our patients with grave injuries of the cranial bone structure using cotton padding to protect areas of exposed brain tissue. Finding a reliable method of osteoplasty was a really urgent task.

One day Burdenko invited me for a talk. "I'm not feeling too brisk these days," he said, "and I don't think I can undertake experiments in deep antiseptic surgery. You are well familiar with the subject. Why don't you start and I'll help you."

The appearance of Nikolai Nilovich, frankly, wrung my heart. After several strokes he had difficulty in moving about, had lost the power of hearing and could hardly articulate. Therefore he preferred to write whatever he had to say. With an unsteady hand Burdenko wrote down the title and a detailed plan of my future doctorate thesis. A few days later he asked Professor Lepukaln whether I had read his plan. Lepukaln, who was acting for Nikolai Nilovich as head of the chair, replied that I had and that I had been a bit overawed by the sheer scale of the project and that I had doubts whether I would be able to complete the whole of it in the time allotted. But he added that I found the subject exciting and challenging. Burdenko commented that he would be happy if I completed at least part of the project. The subject was indeed exciting. It concerned the deep tissue antiseptic techniques employed in treating suppurative inflammations by administering drugs into the arteries.

After thoroughly analysing the existing methods of preventing wound infection and after studying the effect of a variety of antiseptic, bacteriotropic and bacteriostatic preparations, notably, antibiotics, Burdenko reached the conclusion that alongside

developing new synthetic and biological preparations it was essential to improve the methods of administering them. He had come very close to tackling the problem of administering chemical preparations directly into the arterial canal of a particular organ. But Nikolai Nilovich no longer had the strength to complete his project. In 1942, V. N. Paramonov, following Burdenko's instructions, had tried the method of administering sulphanilimide drugs into the carotid artery in the treatment of suppurative meningitis and cerebral abscesses resulting from cranial injuries. In 1943 Burdenko recommended the administration of a penicillin solution into the carotid artery as an effective way of treating suppurative complications in cranio-cerebral injuries. This method made it possible, he reasoned, to achieve a stronger concentration of the drug in the bloodstream, thereby enhancing its effect on the pus focus inside the brain tissue. Incidentally, in the field hospitals of the 44th Army, where they had to deal with many cases of grave head and limb injuries, they made extensive use of Burdenko's method.

Burdenko kept asking Lepukaln whether I had started on my experiments and what progress I had made. Lepukaln always set his mind at rest, telling him in detail about the results obtained and my further plans. He often said to me, "You must realise that your experiments are like a tonic for the old man. Please, don't let him down, try and do everything just right. Every success makes him feel happy. Weak as he may be, he is still capable of giving you sound advice. It is remarkable that his brain is still as sharp as ever, though he has deteriorated physically so."

One day, in the summer of 1945, Alexander Fyodorovich Lepukaln invited me to go with him to Barvikha, a suburb of Moscow, where Burdenko was taking a rest cure. We arrived in brilliant sunshine to find Nikolai Nilovich on the verandah reading his mail. He was deep in thought and did not notice us. I came up and saluted in a military fashion (I was still in my army uniform). Burdenko smiled and nodded approvingly. Then he invited us to join him at his desk and without preliminaries started asking me questions writing them down in pencil on a sheet of paper.

Defying his grave illness, Burdenko continued to work on problems of deep tissue antiseptic measures. He was annoyed whenever someone insisted that he should take a rest and he became very angry when his doctors attempted to limit him to light reading only. Once, in my presence, he wrote an angry note to his doctors: "There is not much time left for me in this world and I

mean to hurry to complete at least part of my project." And he stared at them defiantly.

At last, the experiments with intra-arterial administration of drugs were completed. It occurred to me that we could go beyond that.

I asked Burdenko for his views on the possibility of administering drugs into the left ventricle, by-passing the liver and lung barrier, in order to achieve a stronger concentration of the drug in the internal organs. With the orthodox methods of introducing drugs into the body (per os, intra-muscularly or intravenously) before it ever reached the main arterial canal the drug had to penetrate the cellular membranes of the liver and the lung which acted as filters. This could not but weaken the potency of the drug against microbes within the affected organ.

If a suitable method of by-passing that natural barrier was found, it would then be possible to introduce the drug into the pathological focus with its potency fully preserved.

Burdenko liked the idea. He immediately started to develop it in the context of treating septic conditions with special reference to abscesses of the liver and the lungs. He approved my intention to experiment in this direction and added that it was essential for me to pay close attention to the problem of disinfecting joint tissue, bone marrow, as well as lung, liver and brain tissue.

Burdenko helped us in every way he could to extend the scope of our research. At his request every book on the subject was found and put at our disposal. He urged me not to rest content with the results already obtained but to go forward and develop the idea further.

My encounters with Nikolai Nilovich inspired confidence in the ultimate success of any undertaking. Seeing the constant lively interest he showed in my experiments I redoubled my efforts. I received a lot of help from the research laboratory staff at the 1st Medical Institute in Moscow.

At the end of 1946 I completed my thesis and submitted it to Burdenko for a review. That was the last scientific work supervised by Burdenko. Nikolai Nilovich read my doctorate dissertation carefully and made a number of shrewd and helpful comments. After giving it a positive appraisal he passed it on to the Academic Council. The defence took place shortly afterwards. It was a success and as a result I was made Doctor of Medical Sciences. It was a major and joyous event in my professional life.

Right after the defence of my dissertation I went to see Nikolai Nilovich, who was then in a hospital, to thank him. He

congratulated me with tears of joy and asked me to present him with a copy of the doctorate.

Those were hard days for Burdenko. Bed-ridden by a paralysing disease, it was only his extraordinary willpower that kept him going, writing articles and working on scientific papers.

On October 1, 1946 Moscow played host to the 25th National Congress of Surgeons which brought together the country's leading surgeons. In his opening address to the delegates Professor N. N. Priorov said, "The war has put the work of our organisations to an acid test. It has verified the validity and correctness of our scientific doctrines. A good many theoretical and practical problems of war surgery were successfully solved during the war. This congress faces the task of working out new principles and theories that were first put forward during the war and practically applied in the treatment of wounds."

It was essential above all to review some of the time-honoured canons in surgery of the peripheral nervous system and in brain surgery. A new, branch lung surgery, had come into being. A wealth of experience had been gained in heart surgery. The heart, for centuries a sacrosanct "untouchable" was becoming just another organ to operate on. Effective methods of dealing with osteomyelitis as a sequel to a gun-shot wound had been developed. Success here was so impressive that it was now possible to attack chronic osteomyelitis. In short, a lot that was new had been evolved during the war years. This wealth of experience was now being placed at the service of the medical profession in their job of safeguarding the Soviet people's health. But a lot remained to be done. Formidable killers like TB and polio were still to be eradicated. Hundreds of medical scientists were investigating causative agents of malignant tumours and trying to elaborate effective preventive measures against cancer. These and other problems were discussed at the 25th Congress of Soviet Surgeons.

The paper prepared by N. N. Burdenko (read for him by A. F. Lepukaln) evoked great interest. It was devoted to the treatment of gun-shot wounds and summed up the results of many years of intensive research. Burdenko set out some of his new ideas on the treatment of wounds in the light of the experience gained during the war. "The discovery of antibiotics", he said, "signalled a major advance in man's conquest of nature. But a lot remains to be done in studying antibiotics more closely. Soviet medical scientists and doctors feel confident that the problems presented by antibiotics will successfully overcome."

This was something in the nature of Burdenko's professional testament. On November 11, 1946, Burdenko died. His death was a great loss to medical science and a great loss to me personally, for I owed to him a great deal.

In 1947, I was elected head of the department of operative surgery and topographical anatomy at the First Moscow Medical Institute, where outstanding surgeons like P. A. Herzen and N. N. Burdenko had once worked. My new job brought a new sense of responsibility. In the beginning, I must confess, I felt a little overawed but the fear of inadequacy was lost under the pressure of work.

Those were difficult days for the Soviet medical profession. Many of the old guard had laid down their lives in the war against nazi Germany. Among those who never returned from the front was Nikolai Bayandin, my good friend and colleague. We had been to college together before the war, and after graduation both had taken the same post-graduate course.

In the early months of the war Nikolai Bayandin was on the staff of the mobile field hospital No. 506 that was on the Western Front. In October 1941 the hospital was encircled by nazi troops. Bayandin was taken prisoner together with the wounded in his care. For a long time we did not know what happened to him. It was not until 1943 that N. N. Burdenko, who was a member of the extraordinary commission investigating nazi atrocities in Orel, discovered the full story of Bayandin's last days. He died of typhus in nazi camp.

In July 1942 another fine doctor and patriot died. He was A. N. Voronin, formerly an assistant at the department of histology. When he was leaving for the front with the Moscow People's Volunteer 5th Frunze Division a daughter was born to him. Voronin left a letter for his wife in which he said: "I beg you not to worry. Everything will turn out for the best. I am leaving for the front to defend our happiness." Voronin saved the lives of many wounded officers and men. He was killed in action.

A similar tragic fate overtook Professor S. I. Kaplun who was dean of the department of sanitation and hygiene. At the start of the war when our medical institute was evacuated to Ufa in the Urals and when the student body had shrunk to a minimum, Professor Kaplun was sent to Buryat-Mongolia to deal with an epidemic there. However, he did not stay there long and after his insistent requests was allowed to join the army as a volunteer. He was appointed an army epidemiologist. During his work with the army he repeatedly found himself under enemy shell fire and air

raids. On the fatal day, October 23, 1943, an enemy bomb splinter cut short this good medical scientist's and Communist's life.

N. I. Sokolov, lecturer at our institute, was killed in action during the battle of Moscow. He was with the regiments of People's Volunteers.

Many other doctors, teachers and nurses never returned from the war. Their memory is revered by the staff of the First Moscow Medical Institute. Their names have been inscribed on a marble plaque put up in the institute's conference hall. Every year the first-year students and graduates come here to take their professional oath.

After recovering from a grave wound Dmitry Martynov returned to our institute's surgical clinic. Before the war Dmitry had worked as an assistant on the staff of a neighbouring surgical clinic which his father, an eminent surgeon, had at one time headed. Dmitry had successfully gone through the war and was looking forward to his return to the clinic. It was the spring of 1945, when a nazi bomber attacked the field hospital where Dmitry was operating on a soldier. A bomb splinter wounded Martynov in the head.

Ksenia Ivanovna Churkina was among those who did not come back after demobilisation. Instead she got a job in the surgical department of a Moscow polyclinic. Apart from her work in the polyclinic she had many other problems that claimed her attention. She had to see to it that the nurses she had trained continued their education. As usual, her own problems took a back seat. That was the way she lived and worked year after year until she reached retirement age.

One day in 1969 I received a telephone call. I immediately recognised Churkina's soft voice. She asked me to come and see her. I felt that something was very wrong and left immediately. I arrived to see a much changed Churkina sitting in an armchair her legs swollen and her face pale. Smiling apologetically she told me that her breast had bothered her for some months. She had not thought there was anything really wrong with her and had not seen any specialist. She hoped the pain would go but it did not. I insisted on her immediate hospitalisation. The next morning Professor V. I. Struchkov called to tell me that Churkina had a bad case of breast cancer. Instinctively, Ksenia Ivanovna realised that her disease was too far gone. She was growing weaker daily, the disease sapping her strength. Nevertheless she tried to put a bold face on it and made herself useful in the ward. She looked after her fellow-patients and encouraged those of them who were waiting their turn on the operating table.

One day she told me the following story. It happened a year previously she had been making regular shopping trips in the morning. The shop was across the road and to save time she used to take a short cut and cross the street where no crossing was allowed by the traffic rules. Whenever she did so, a young militiaman on point duty stopped her in the middle of the street with his imperious whistling. He would saunter over to her looking important and would launch into a lecture about the importance of crossing the street in the right place. As he did so, he would set his holster right and bulge his chest bespangled with his service badges. After the lecture the militiaman would mercifully allow her to cross the street in the wrong place "for the last time". Eventually Ksenia Ivanovna decided to try a trick. One day she put on her old service tunic with signs signifying her rank and pinned all her war medals and orders on. That done, she set out on her shopping trip across the street crossing as usual in the wrong place. When the militiaman saw her in her wartime regalia he clicked his heels and saluted smartly. When Ksenia Ivanovna drew level with him the militiaman exclaimed: "I never knew you were a war hero, old lady. As of today you may cross the street wherever you like." And indeed from that day on whenever Ksenia Ivanovna had to cross the street the sergeant stopped traffic and let her cross in safety.

She was a remarkable woman, courageous, staunch and with an insatiable love of life.

Those students who had been through the war could easily be recognised by their military bearing and their sense of discipline. In many respects things were more difficult for them than for the others. Nevertheless, they set an example for the rest by their responsible and conscientious attitude both to academic studies and social work.

Yuri Kopayev, formerly chief of staff of an air force regiment, and a second-year student after the war, was working hard at anatomy and histology. At the same time, as deputy secretary of the institute's Party branch, he was an active social worker.

Igor Sychenikov, who was decorated with the Order of the Red Star for valour in action, was elected leader of the Institute's Komsomol organisation.

Mikhail Kuzmin was among those who were very much to the fore in the institute's social activity. A few days before the end of the war he had lost an arm. However, he had willpower enough to study well and took top marks in all subjects. It was only his close friends who knew what it cost Mikhail to bear stoically frequent attacks of excruciating pain that set in after tiring hours in the



auditorium and laboratories. For all that, he was always calm and cheerful.

The ex-servicemen among the students exerted a beneficial influence on the atmosphere both in the academic groups and in the clinics. They set a good example of a conscientious attitude to work and study and helped those students who were fresh from school. Also their example discouraged those of the younger students who were inclined to play hooky and neglect their studies.

Many of the girl students, who dominated the student body, had been through the war too. Some of them had seen front-line action while others were with partisan detachments. The rest, who had worked in industry and in agriculture, had done their bit for the country by replacing men in many jobs. They had learned to cope with the difficulties and had cultivated a fine sense of duty.

In many ways student life in the immediate post-war years resembled my own life as a student. Komsomols helped the collective farmers gather in the harvest, helped to unload vegetables from goods trains at the city's railway terminals and sorted potatoes at the vegetable storage depots. Nobody complained of ill health or invoked the plea of family problems. Everyone realised the need to contribute his share to the titanic effort of reconstructing the nation's war-ravaged economy.

During the war years the institute building, understandably, had not been repaired. The students themselves (of their own accord) scrubbed the floors in the wards and did minor repairs. An atmosphere of friendship, cooperation and concentration was typical in those days. An exemplary silence reigned supreme in the lecture rooms, with every student taking notes.

In the war years the institute's surgical department had been dominated by women. When the men returned from the war they took over the most difficult and time-consuming jobs.

To begin with, we faced many problems. A large proportion of the laboratory equipment had to be repaired and replaced and new equipment and instruments had to be acquired. Some of the equipment that had been evacuated to Ufa was damaged in transit. Some was left at the medical institute in Ufa. A proportion of the equipment brought back to Moscow was now hopelessly obsolete and had to be replaced. Gradually, thanks to the efforts of enthusiasts, the necessary facilities and equipment were obtained.

Many of the departments at our institute were headed by eminent medical scientists, including A. I. Abrikosov, I. P. Razenkov, B. I. Zbarsky, E. K. Sepp and others. The hospital surgery department was headed by M. N. Akhutin. An

excellent lecturer, he enjoyed tremendous respect and popularity among the students. The war years had told on his health however. Mikhail Nikiforovich, a fine physician that he was, diagnosed the nature of his own illness and even set the date of his death. He spoke of the approaching death in a simple and matter-of-fact way. One thing alone worried him, and that was whether he would have enough time left to complete his project. He was up to the neck in work and refused point blank to take a holiday and a rest cure. Akhutin died at 51. Everyone who knew him was grieved by the loss of such a talented scientist and man of courage.

His place as head of the hospital therapeutics clinic was now taken by Professor A. L. Myasnikov, who had been invited to come from Leningrad.

There was hardly another lecturer at our institute who could compare with him in eloquence and wealth of metaphore. The students always looked forward to his lectures, case discussions during his rounds or at the sessions of students' scientific society.

During Myasnikov's reign the clinic became a major centre for diagnosis and treatment of cardiovascular diseases as well as a training ground for future teachers and general practitioners. When he was appointed director of the Therapeutics Research Institute under the USSR Academy of Medical Sciences, Myasnikov continued to read lectures in therapeutics at our institute. However busy he would be at his own institute, there was not a single case when he called off a lecture or a review of case histories for the students. With him the training of students took priority, though he devoted a good deal of time to his own intensive research.

Professor Myasnikov published monographs on cardiovascular diseases almost every year. He was an acknowledged authority on the treatment of atherosclerosis giving frequent talks before professional audiences and popular lectures on topical problems of medical science on the radio and television. He had made a sizeable contribution to the prophylaxis of cardiovascular diseases, and many people still living owe their lives to his recommendations.

On many occasions A. L. Myasnikov represented Soviet medical science at various international congresses, conferences and symposiums. He was awarded the "Gold Stethoscope" by the World Association of Cardiologists in recognition of his services to world medical science.

Professor Myasnikov's reports to sessions of the Academic Council were noted for their expertise, profundity and

imaginativeness. At times some of his opinions sounded perhaps too brusque, but then he was unable to reconcile himself with mediocrity, narrow-mindedness and complacency. No power on earth would ever make him vote for a dissertation if he thought it contained no new ideas. Alexander Leonidovich would vote against elevating someone to the status of professor or docent if, in his judgement, the candidate lacked some of the right sort of qualifications. At the same time he was an extremely considerate and cooperative man, kind and responsible. His patients adored him not only as a top calibre medical specialist but also as a considerate and kindhearted person.

Professor Myasnikov was intolerant of any breaches of discipline and medical ethics even in his close friends and members of his family. One day, upon learning that his younger son, who was a student at our institute, had committed an offense, he came to see me (at the time I was rector of the institute). Pacing to and fro he spluttered in fury, "Get rid of him! Kick him out! That will teach him a lesson!"

It took a lot of gentle persuasion to calm him down.

Unfortunately, Alexander Leonidovich did not live to see the 50th anniversary of the Soviet state, of which he was a most worthy citizen and builder. After his death the Moscow Institute of Cardiology of the USSR Academy of Medical Sciences was named after him.

The department of faculty surgery, at one time captained by N. N. Burdenko, was now headed by N. N. Elansky, Lieutenant-General of the Medical Corps. He was a worthy successor to the great Burdenko. A graduate of the Kirov Military Medical Academy, Nikolai Nikolayevich for a long time worked under the guidance of the eminent surgeon S. P. Fedorov. Elansky took part in the fighting at Khalkhin-Gol and in Finland. Later, during the war against nazi Germany, he was appointed Chief Surgeon of a Front. He came to our institute with a wealth of experience to his credit both on the organisational and scientific side of surgical work. As a lecturer, Elansky did not perhaps enjoy the popularity Myasnikov or Akhutin did, nevertheless, he had his own forte. He was a master surgeon in the full sense of the word. Anyone who watched him in action at the operating table or during his rounds of the wards, talking to patients, could not but feel the highest respect and admiration for the man.

Elansky was of giant stature, and it was hard to believe that this mountain of a man with his huge hands and thick fingers could

perform the most delicate manipulations on the blood vessels. His manual skill was amazing.

In fact, Nikolai Nikolayevich was so tall and big that he dwarfed every one. When I had occasion to accompany Elansky during our trips abroad I often saw our foreign colleagues glancing at him with admiration. He was a fine figure of a man, handsome in the typically Russian way. Nikolai Nikolayevich, however, often complained of nature's generosity to him. According to him it was more of an impediment than a help in his work. He argued, "Whenever I had to go and visit field hospitals during the war I brought problems with me of the most unexpected kind. For instance, they could not find me a smock of the right size. It would always be too small. Nor could they find me a bed that was long enough. As for footwear it was just hopeless, no one could provide me with a pair of shoes of the right size. All my life I have had shoes made to order."

When the staff of our institute got together to celebrate Elansky's 70th birthday and the award of the title, Hero of Socialist Labour, Marshal Konev, who spoke at the gathering, related the following episode that happened during the war. In the fighting outside Budapest in the spring of 1945 Lieutenant-General Afonin, a corps commander, sustained a grave injury. Marshal Konev asked Elansky to attend to the wounded General immediately. Spring floods had made the roads impassable and Nikolai Nikolayevich decided to do the journey by light plane. When he arrived at the air strip however he discovered, much to his dismay, that he could not possibly fit into the cockpit. The pilot suggested that Elansky should put the main part of his huge bulk into the cockpit while his legs could be left on the outside. Ridiculous as the suggestion was Elansky had to agree, for there was no other way.

The audience in the hall had a hearty laugh as they listened to the story. Marshal Konev was followed by Elansky's former patient Lieutenant-General Afonin, who said that had it not been for Nikolai Nikolayevich he would not have had the pleasure of attending the latter's 70th birthday celebration. On that occasion he sustained grave injuries to his head, and also to his abdomen, arms and legs. So without exaggeration Elansky was his saviour, he concluded.

The therapeutical clinic was next to the surgical department building. After Konchalovsky's death it was headed by V. N. Vinogradov, an internist of repute.

Vinogradov's activities were varied and the range of his scientific research wide. A genuine innovator in science and a splendid

diagnostician, he continually devised new and more advanced methods of treatment. For all that, however, he was cautious and would not be hurried into prescribing "fashionable" preparations that had not yet been adequately tested. Vinogradov was full of consideration and compassion to his patients. Among other things, he did everything in his power to create a congenial and "protective" environment for his patients to make them feel as much "at home" in the clinic as possible.

Vinogradov demanded that all of his prescriptions be followed to the letter. His prestige as a physician was unchallengeable. There was not his peer in terms of knowledge, experience, skill in managing a patient and ability to win his confidence.

I remember one episode. I was showing Eleanor Roosevelt our institute during one of her visits to the USSR. According to the programme her visit was to last for half an hour. Therefore I decided to show her round Vinogradov's clinic only. I was more than a little surprised when a solid five hours later I learned that Eleanor Roosevelt was still inside the clinic. Vladimir Nikitovich impressed her so favourably as a physician that she decided to consult him about her health. Vladimir Nikitovich with his characteristic tact went into all her complaints and proceeded to examine Eleanor Roosevelt most thoroughly. He made a detailed diagnosis and recommended a course of treatment. At the time Eleanor Roosevelt was over 70 and Vladimir Nikitovich was about as old.

A year later I happened to be in New York on a visit and was invited by Eleanor Roosevelt to dinner. On that occasion she spoke with great warmth and gratitude about Vladimir Nikitovich who had produced a great impression on her as a physician and person. During that visit I was accompanied by P. I. Androsov, a well-known Moscow surgeon. During dinner which had been cooked by Mrs. Roosevelt herself we sat at the table together with her grown-up children and grandchildren. The hostess served single-handed. As I was told by one of her grand-daughters that was a long established custom with the family. For desert we were offered apple pie baked by the hostess. It looked most appetising, but, I noticed that my neighbours, having taken a bite, were in no hurry to eat it up. I decided to try it myself. When I did I immediately realised that the apple pie was only half baked. However, Androsov, out of the desire to please the hostess, ate the whole of his helping and complimented Mrs. Roosevelt on her culinary art. I then decided to punish Androsov for his inordinate inclination to flattery and asked Mrs. Roosevelt to give Androsov another helping

which she did with alacrity. Afterwards, with great relish, Androsof told me exactly what he thought of me.

In the immediate post-war years, Professor Anokhin, a well-known physiologist and a pupil of Academician Pavlov, joined the staff of our institute. Anokhin formulated the principle of "feedback", one of the cornerstones of modern cybernetics. His research in neurophysiology, neurocybernetics and neurobionics has earned him universal recognition. In 1968 Professor Anokhin was awarded the Pavlov gold medal in recognition of his contribution to physiology. Anokhin's combination of erudition, bold ideas and refreshing wit coupled with excellent delivery won him high regard among the students who eagerly looked forward to his next lecture. The department of normal physiology of which Professor Anokhin was head, had an impressive array of advanced equipment including sophisticated electronic devices for the study of the central nervous system. Professor Anokhin willingly shares his tremendous experience and knowledge with his students. Despite repeated invitations from medical research institutions to devote himself to research on a full-time basis Professor Anokhin refused to part company with the First Medical Institute.

The department of hospital surgery was headed by Boris Vasilyevich Petrovsky, another eminent surgeon. His work contributed greatly to the First Moscow Medical Institute's growing prestige both at home and abroad.

Despite his numerous engagements in the clinic, at the Institute and as Minister of Health, Academician B. V. Petrovsky never cancels his lectures. He treasures his contacts with the students and willingly shares his extensive experience with them. His lectures are attended not only by students but also by research assistants and interns. A fine clinician and lecturer, he reveals to his listeners the great potential resources of surgery. Professor Petrovsky has a genius for establishing good rapport with his patients and winning their confidence.

Academician Petrovsky is the founder of one of the largest surgical schools in the USSR. Himself an eminent surgeon, he has groomed to professional greatness dozens of young surgeons, who are now heading the surgical departments of many medical institutes and hospitals across the country. Petrovsky has pioneered a surgical method for the treatment of diseases of the esophagus, diaphragm and cardiovascular defects. In 1960 he was awarded the Lenin Prize for developing and introducing into hospital practice heart operations. In 1971 Academician Petrovsky, along with

several other medical scientists, won the State Prize for their kidney transplantation operations.

Academician B. V. Petrovsky is well known both in this country and abroad. He has been elected an honorary member of many medical academies and scientific societies of Europe.

The department of biological chemistry was headed by Professor Sergei Mordashev, a pupil of the famous Professor B. I. Zbarsky.

Back at the institute after demobilisation, our staff workers were so thirsty for scientific research that they spent days on end in the clinics and laboratories in an effort to make up for lost time. Many worked on their theses, and before long I. M. Papavyan and I. V. Shmelev, my good friends from the war days successfully defended their doctorates. Theirs were neat pieces of imaginative research and analysis. Papavyan and Shmelev, made wise by practical experience in field hospitals, reported on their enquiries carried out in the incredibly difficult wartime conditions backing up their conclusions with experimental findings obtained after the war in the institute's laboratories.

Vasili Alexeyevich Ivanov, formerly our YCL leader, defended his doctorate about the same time as Papavyan and Shmelev. Ivanov had been with the acting army from the opening days of the war. To begin with, he worked as a surgeon in the 26th Rifle Brigade field hospital. Later he was promoted to Army Surgeon. During the heavy fighting near Tarusa his brigade sustained heavy losses. The wounded wanting emergency surgical help were coming in in an ever mounting stream. Ivanov, as the senior surgeon, did not leave the operating table for several days on end. He was so tired that he took quick naps sitting in a chair during the brief intervals between operations.

One December evening in 1941 he was called into a clearing post to attend a signalman who had been brought in with a rather uncommon injury. An enemy mortar bomb had gone through one of his felt boots, entered the muscular tissue of the shin and had got stuck there. When Vasili Alexeyevich approached the wounded signalman to examine him the man warned him: "Careful, doctor. You never know when it may go off." Taking every precaution Ivanov had the wounded man transferred to the operating room. The operating room was cleared of all but three occupants — the wounded man, a nurse and himself. After putting the man to sleep Ivanov cut the felt boot apart with a knife and exposed the shin with the bomb sticking in it. He then cut out the bomb very carefully and passed it on to the aidman who was standing outside the entrance. The latter took the bomb and chucked it into a

nearby hole and off it went. Later, when the signalman was safely out of danger, Ivanov was able to appreciate the calm courage of the wounded man and those who had found him on the battlefield and had run a tremendous risk bringing him to the hospital. The journey was rather bumpy and the bomb could have exploded at any moment.

This episode was reported in the front press, and the news of it reached our hospital. I must say I felt very proud of my colleague's courage.

Today Ivanov is a well-known surgeon and a professor in charge of a department at Moscow's Patrice Lumumba Friendship University.

Unfortunately, some of our more eminent teachers, like Vsevolod Salishchev and a few others, left the department much sooner than expected.

Salishchev explained his motives thus, "I feel that I have reached the ceiling in surgery, and I admit it honestly." For many years after he had left our department Salishchev was a very helpful consultant and adviser on the organisational side.

## II. SCIENCE KNOWS NO MINOR DISCOVERIES

*"The entire meaning of human experience resides in the interminable conquest of the unknown, in the eternal quest for new knowledge...."*

*Emile Zola*

### New Challenges

The operative surgery department was housed in the same building as the pathological anatomy department. The successes scored by our neighbours both in research and in academic activity spurred us on, and I often thought hard of ways and means of keeping up with them.

We realised very well that success largely depended on the careful selection of a good team united by a common scientific idea. It was as head of the operative surgery department that I



appreciated in full the validity of Lenin's proposition on the need to combine old, experienced workers with young ones. I did my best to unite the efforts of our research workers and direct them at the solution of topical problems both on the theoretical and practical planes.

In the beginning we were handicapped by a lack of knowledge and experience, which made it impossible for us to undertake large-scale projects. I had to spend a good deal of my time keeping abreast of the latest developments in my own field and at the same time had to help my junior colleagues.

My predecessor I. S. Zhorov had worked on the problem of ligating large arteries in the upper and lower extremities under battlefield conditions. During the war, Zhorov, like myself, had encountered baffling cases where ligation of a damaged large blood vessel often resulted in subsequent necrosis of the extremity. When we came back from the war we continued research into the problem in laboratory and clinic. Experimental findings confirmed what we had long suspected: the ligature of blood vessels in the upper corner of the popliteal fossa in cases involving a damage to the popliteal artery did not result in a necrosis of the shin, while the ligature of the same artery in the lower corner did. One of our post-graduates V. M. Volskaya staged a series of experiments to demonstrate the role played by the number of blood vessels involved in circulating blood above and below the vasoligatures on the artery, in restoring normal circulation in the extremity. It was established that a greater number of blood vessels participate when the artery is ligated in the upper corner of the popliteal fossa. In this way an important adjustment was introduced into the relevant operative technique.

More rational ligating techniques were developed step by step for the thigh, shin, shoulder and neck. Finally, we tackled the problem of extending indications for suturing damaged blood vessels, as well as the question of replacing a damaged section of a blood vessel with biological or synthetic materials.

Each worker conducted his own series of experiments. Someone would be working on the ligature of the gluteal artery, his neighbour on the ligature of the subclavial artery, while a third on the ligature of the cervical artery. In the evening they all got together to compare notes, analyse their findings and do a bit of joint thinking. In this way new ideas were born and answers found. This experimental work provided the basis for future theses.

In due course it became clear that anatomical research alone could not give us an insight into every aspect of vasopathology. It

was found for instance that even given anatomical adequacy of the vessels following a ligature of the main trunk they may remain severely constricted, thus leading to necrosis of the extremity.

It was then that N. B. Dobrova and V. I. Shumakov began to inject into the fascial vagina vasorum a few cubic centimetres of a two per cent novocain solution. The effect was striking: the collateral vessels dilated and functioned normally after ligature or section of the main arterial trunk. No necrosis set in.

It was established that the introduction of an anaesthetic into the vessel bed instantaneously paralysed the wall's nervous apparatus. This makes for a vigorous dilation of the vasolumen and sufficient blood is then supplied to the lower lying tissues. The results obtained from tests on laboratory animals corroborated our conjecture and we subsequently recommended this method as a standard surgical procedure.

Soon afterwards Professor Shmelev verified our experimental findings in a clinical situation and obtained excellent results. That was the first step towards establishing a close contact between laboratory and clinic.

One day after a lecture on operations on blood vessels using a suturing device I was approached by Gleb Solovyov, one of the students, who asked me whether it would be worthwhile for him to work on improving manual suturing techniques. He was not sure that the problem was topical any more because there was a suturing device. I replied that a good manual suture was still as important as ever. Under some circumstances manual suturing of blood vessels was even preferable. The important thing, I added, was that the manual suture should be simple to make and did not lead to a subsequent clot at the site. Little did I know at the time that that conversation would be the starting point of Solovyov's career. Two years later Solovyov was retained for a post-graduate course at our department. Before long he developed an ingenious method of joining blood vessels, a method based on the complete isolation of the vasolumen from the damaged section of the vessel wall and the suturing material. The chief merit of the new technique was that the suture could be applied quickly, was easy of execution, while also being reliable and precluding any possibility of a clot.

I should perhaps explain at this point that blood vessels consist of three layers: internal, which is smooth to enable blood to flow without obstruction, medium, or muscular, which constricts or dilates the blood vessel, and the surface layer which is a sort of outer casing. During an operation on arteries and veins it is im-

portant to ensure that the inside of the vessel remains perfectly smooth without any flaws.

Later Gleb Solovyov went to work at Academician Petrovsky's clinic, where he tackled a new problem, that of extracorporeal circulation for operations on what is known as the "dry heart" (when the heart is cut off from the bloodstream). His papers and articles in medical journals, as well as his ingenious operative techniques, evoked a good deal of interest among his colleagues. Solovyov was a frequent delegate to international congresses and conferences and his articles were published in the press. He was making quick progress towards becoming a major authority on surgical treatment of congenital and acquired heart defects.

In 1967 G. M. Solovyov, a Professor and Doctor of Medical Sciences, was elected a Corresponding Member of the USSR Academy of Medical Sciences.

Valery Shumakov was another student who achieved a high professional standard working in our department. He was also interested in heart surgery and the surgery of blood vessels. He was a very diligent worker who could spend day and night in a laboratory conducting experiments, working out new operative models and carefully studying approaches to that all-important organ — the heart.

At one point, Valery Shumakov was looking into the problem of surgically treating the aftereffects of rheumatism, when the heart valves are severely damaged and the patient is permanently incapacitated. There are various theories and methods of restoring the crippled valves. Further work on this problem is now based on success achieved in the laboratory and clinic. Ten years ago, however, when we began tackling this problem we had neither sufficient experience nor adequate knowledge. Our foreign colleagues working in this field could not boast of encouraging results either.

The human heart is a pump with its valves playing much the same role as valves in engineering. They ensure a one-way flow of blood. Contraction of the heart muscle is followed by its relaxation, the valves keep opening and closing. If the valves are damaged by infection the heart's function as a pump is upset. To restore normal functioning various types of artificial valve have been developed. This is something to which V. I. Shumakov devoted several years of intensive research. Eventually he succeeded in developing an ingenious method of narrowing the aperture between the ventricle and the auricle. Today this method is known as the Shumakov technique.

When he completed his post-graduate course Valery Shumakov went to the Institute of Experimental and Clinical Surgery. There he acquired professorial status and is now head of a laboratory which is developing a man-made heart. This project seems very promising.

Y. Bredikis took a post-graduate course in our department at the same time as Solovyov. Bredikis came to us from the medical institute in Kaunas, Lithuania. Tall, powerfully built, he had an impressive physique (incidentally Bredikis had been an enthusiastic amateur weight lifter). Like Solovyov, Bredikis was attracted by the idea of surgically treating cardiac disorders, but he went about it in his own way. After working out a projection on the thorax of the most important parts of the heart he proceeded to study the heart's response to a variety of mechanical influences ranging from punctures to cuts inflicted during an operation. I, too, at one time studied the reaction of the cardiac tissue to punctures with a needle. Y. Bredikis started from introducing drugs into the left ventricle, a method which I had developed earlier. But he went beyond that. He proved that the heart can survive traumas inflicted by a surgeon's scalpel as well as a needle. These findings, obtained from experiments on lab animals, enabled us to extend the range of operative interference on the heart up to a section of its cavities (cardiotomy).

Back in his home city of Kaunas and heading the surgical department at his institute, Bredikis began exploring a new area of surgery—reconstructive heart surgery and achieved considerable success in it. These days, apart from being a top surgeon, Bredikis is an active public figure. In 1969 he was elected a Corresponding Member of the USSR Academy of Medical Sciences.

Heart surgery and the surgery of blood vessels, our departmental staff's main themes of research, were increasingly attracting gifted young workers. Some of them were so enthusiastic that they thought nothing of spending night after night in the laboratory slaving in the name of medical science.

Natalia Borisovna Dobrova, a young lecturer and assistant surgeon, was the focal point of a group of enthusiasts who studied operations on large and small blood vessels. Natalia Borisovna, accompanied by her helpers and assistants, operated on laboratory animals. The dog was placed on ice to lower its body temperature. The artificial heart-and-lung machine and instruments monitoring the functioning of the essential systems (arterial and venous pressure, the brain biological potentials, etc.) were switched on. The dog was made to breathe artificially. The operation on the

aorta lasted several hours. Helped by her pupils, Dobrova worked out a model of a new operation—excision of part of the arterial trunk replacing it with a corrugated synthetic tube. Most of the dogs lived on with this prosthesis for quite a long time.

There were some bizarre incidents. One day Boris Konstantinov, one of the eager beavers, was out walking a dog with a man-made aorta arch. He was immediately surrounded by his friends. Konstantinov, apparently inspired by the presence of his girl friend, launched into a detailed story about the successful operation pointing at the dog as a living illustration and proof of complete success. He added that the dog had grown very attached to him during the post-operative period. To prove his point he dropped the leash. The dog as if it had been waiting for its chance to regain freedom shot off and was never found again.

To start with, things did not go very smoothly. The corrugated prosthesis proved to be too porous so that blood could seep through its walls. A lot of hard thinking had to be done before an alternative material was found. One other knotty problem was finding a good method of joining the prosthesis to the blood vessels. The students made dozens of operations perfecting their suturing techniques on dogs, applying both manual and mechanical sutures.

Finally, an operation that originally took six to seven hours was cut down to one and a half hours. The sutures applied at the joint between prosthesis and blood vessels held well, the corrugated tube fitted perfectly and the dog survived the complex operation relatively easily. Over 50 such operations were performed, most of them producing good results. This was encouraging news, and it enabled us to recommend the operation for clinical use. In the 1950s no one had performed such operations on human patients in the Soviet Union or any other country for that matter, with the exception being De Bakey in the United States.

Before long the idea of replacing sections of blood vessels with synthetic tubes got such a strong hold on Dobrova that she gave up lecturing and got a job at a research institute full time. There she headed a laboratory developing plastics for use in surgery. She was instrumental in developing new types of prostheses both for blood vessels and for heart valves. Her papers and contributions to medical congresses and conferences as well as articles in various medical journals provoked great interest among the specialists.

Dobrova became a link, as it were, between chemical factories and medical institutions. A few years later when the Ministry of Health discussed the formation of a special institute to study

polymers for use in medicine, Natalia Borisovna was invited to work there as deputy director for science.

Boris Konstantinov, Dobrova's former pupil and closest assistant, completed his post-graduate course and was invited, on our recommendation, to the Bakulev Institute of Cardiovascular Surgery. He soon became a major authority on heart operations on newborn infants. This is where his surgical skill and his organisational talent were demonstrated most strikingly. He was a wonderful expert in diagnosis, surgical treatment and post-operative care of the little patients.

Surgical treatment of blood vessels was one of the major problems tackled by our department. Marina Bilenko undertook to study operations on small-diameter blood vessels. She was well fitted for this task, being a persevering type with an extraordinary singleness of purpose, apart from being a neat surgeon. She would spend days looking for the right source books and comparing data until she had found what she was looking for, whether she was working on a major theoretical problem or a minor detail of purely practical importance. It was Bilenko who noticed that the frequency of complications following operations on blood vessels depended on the choice of replacement material and the diameter of the vessel involved—the greater the diameter the better the results.

Marina began looking for suitable materials. She tested a great variety of biological and synthetic materials to demonstrate that the best results were achieved when a replacement operation used veins of the animal subject itself. Besides this, Bilenko proved that a mechanical suture was preferable to a manual one because however excellent his skill, a surgeon finds it difficult to manipulate the small vessels as neatly as the suturing device. While preferring a mechanical suture for operations involving an infection-free wound, we wondered if it was best for operations involving a suppurated wound. Can vasoligatures be used at all in such cases? The view was prevalent at the time that infection inside the wound inevitably causes the vessel wall at the suture site to melt away. Therefore surgeons refrained from suturing blood vessels in suppurated wounds confining themselves to ligating them.

I. A. Sychenikov, one of our assistant lecturers, conducted a series of experiments on lab animals to demonstrate that sutures could be applied without fear in a suppurated wound provided antibiotics were employed. He followed it up with another series of experiments in angioplasty employing semi-biological prostheses

impregnated with heparin, an anti-coagulant, and antibiotics to combat infection in the wound. Incidentally, this work formed the basis of his doctorate, which he defended in brilliant style in 1972.

### Everyone's Contribution

Ilya Novikov, one of the post-graduates working at our department, had sustained a serious leg injury in the first months of the war, which made him an invalid. Having a crippled leg myself, I know what it's like and have always admired Novikov's tenacity and quiet courage. Novikov was looking for an answer to the question of why, when an extremity is amputated, it is often impossible to relieve pain and eliminate severe complications, such as shock. I knew that he was particularly interested in the thigh and suggested to him that he should carefully explore the femoral muscle sheaths' structure. This was the problem that attracted Pirogov's attention back in the mid-19th century. Novikov was to examine the femoral muscle sheaths to discover their role in the spread of suppurative complications and in the action of anaesthetic when an extremity was amputated. He established that the muscle sheaths had defects (holes) that differed from the thigh base to thigh periphery. These holes enable the sheaths to communicate with one another. Moreover, he found out why, despite an effective local anaesthetic, the patient was sometimes in great pain during the section of his thigh muscles. The major nerve trunks of the thigh, notably the ischiadic nerve, had an independent and well pronounced connective tissue sheath. Unless the injection penetrates this sheath the nerve does not completely lose its sensitivity. Novikov proved that anaesthetic must be injected in the sheaths of the major nerve trunks as well as in the muscle tissue. This procedure would preclude operation failures and eliminate grave outcomes. One day he told me that if the surgeon who had operated on his leg during the war had known about the sheaths and how to administer the anaesthetic properly he would have been spared a good deal of suffering.

A few other post-graduate students worked on the problem of connective tissue sheaths. Thus V. A. Klepikov, who also fought in the war, did an interesting piece of research into the fascial formations of the hand. Irina Kotelnikova gathered material on the structure of the fascial sheaths of the shin muscles. T. M. Kariev explored the fascias cellular spaces of the shoulder. A. I. Emelyashenkov studied the cellular spaces of the shoulder girdle. I. G. Gurbanaliev obtained interesting data on the

topographical anatomy of the shoulder joint. L. B. Simonova explored fascias and cellular spaces of the human nates.

Each worker contributed his share towards solving a common scientific problem. Each worker took the occasional failures very much to heart. I remember how Irina Kotelnikova suffered when she failed to master the delicate art of making anatomic preparations. Irina joined our department after she graduated from her medical college. And although normally when we select post-graduate students we prefer to take doctors with experience in surgery, we decided to make an exception of Kotelnikova. Shortly afterwards I suggested a subject to her for her candidate's thesis: to study the connective tissue sheaths of the shin muscles. The fact is that the shin is often the seat of grave complications following both gunshot wounds and industrial injuries. Irina plunged into work with all the enthusiasm of youth. But being young and apparently fired by the desire to show that she was able to complete the project single-handed, Kotelnikova avoided asking her colleagues for help. She overestimated her ability and grasp of the subject. Her final report at a medical conference came under fire for serious flaws in the documentation of the anatomical material. She had to start all over again. As the supervisor of her project I too came in for my share of criticism. Tamara Ivanovna Anikina, secretary of our Party committee, gave me a thorough wiggling for failing to provide adequate guidance for Kotelnikova and for leaving her without proper supervision and control. The criticism was perfectly justified and there was nothing left for me to do but draw proper conclusions for the future.

Professor Travin, my deputy, joined me in making a careful check of the records made by our post-graduates. We began to scrutinise the work of our younger colleagues on a regular basis and would sometimes ask them to rewrite chapters already finished and do more detailed research. We did everything in our power to ensure that each thesis submitted for defence received top marks from the Academic Council.

T. I. Anikina undertook to study the fascial growth of the human face, a very complex and little studied field. The face, a comparatively small area, has a number of vital organs and anatomical formations closely linked with one another by fascias and cellular fissures. Tamara Ivanovna did a fine job of exploring their structure and providing satisfactory explanations for the course and development of inflammatory processes on the face, pointing out the more rational approaches to the foci of purulent inflammation in the deep recesses, and recommending effective



anaesthetic procedures. Anikina's findings formed the basis for her doctorate.

Tamara Ivanovna is a gifted teacher with a rare sense of method and a conscientious approach. Despite her ill health she is struggling on and doing a lot of useful work in the laboratory, mastering complex techniques and working through heaps of scientific literature. Apart from her research she gives regular consultations in the clinic. At the same time, as secretary of our Party committee, she gives a good deal of her time to her comrades.

Anikina and I summarised the materials relating to the study of human fascias obtained at our department in a joint book which later won the Shevkunenko Prize instituted by the presidium of the USSR Academy of Medical Sciences.

A paragon of scientific honesty and conscientiousness, Anikina is constantly urging her colleagues to do their utmost to ensure that each thesis produced by our department meets the most exacting criteria. And it can be said without exaggeration that they could be no more exacting than in our department. A thesis submitted for defence is expected to contain new ideas and theoretical conclusions well-grounded in fact and backed up by tables, drawings and X-ray photographs. A candidate for the degree is expected to present his thesis before the Academic Council in the proper style. If he stammers, stumbles or peeps into the text, the defence is postponed. We believe that it is not only the candidate concerned who takes an exam before the Academic Council but all the members of his particular department. That is why the defence of each thesis is a landmark for our department, something that affects everyone, from the professor to the last nurse.

We regard lectures as an essential component in the training of our students and work to improve them in every way. We demand that the lecturers not only deliver them well, but also illustrate them with graphic photographs and accompany them, whenever necessary, with films. To help the students master the material presented, especially material relating to a particularly complex operation, we have prepared a series of colour films to be used with the lectures.

Practical sessions are conducted parallel to the theoretical course. These are supervised by post-graduates in their second year and by assistant-lecturers. During practical sessions allotted by the curriculum to operative surgery the student covers the essential parts of the human body and learns to perform typical operations. Each practical session is packed with valuable information. The

student is expected to work hard not only in the auditorium and laboratory but also at home, using atlases, manuals and textbooks. Those students wishing to make an in-depth study of our particular discipline join the student scientific society, help surgeons perform operations, and stage experiments. Later many of them are assigned subject for independent study.

The teacher's active influence on the student group is absolutely essential. The lecturer is expected not only to share his knowledge with the students in his charge, but also to excite their interest in surgery and make them fall in love with it. The student group is a small unit of young people welded together by a common goal. Each student has a different character and level of knowledge, and it is the teacher's job to be in good rapport with each of them and share in his problems and concerns. The students had reached our institute by different paths. Some had entered a medical college fresh from school, others had done a stint in the army before going to college, while others still had worked for several years in industry or at hospitals. It is only to be expected that their knowledge and ages would vary widely. In this situation the teacher should approach each student in a strictly individual way, allowing for his ability and level of knowledge.

It so happened that when I conceived the idea of bringing together and generalising our department's experience in teaching topographical anatomy and operative surgery, I discovered that my assistants had been thinking for some time along the same lines. We decided to compile a practical manual of topographical anatomy which would enable both students and practising physicians to study the surgical anatomy of all the basic regions of the human body on their own. Particular emphasis was to be placed on the anatomical formations which determine the significance of a particular human organ in surgical terms (the larger blood vessels, nerves, joints, etc.).

Our project was fairly ambitious promising a lot of hard work and painstaking research. No such manual had ever been attempted before. Unlike the existing topographical anatomy textbooks our manual was to contain a detailed description of the various procedures to be followed in making anatomical preparations region by region, that is to say description which allowed the anatomical formations required to be located quickly. To this end the material in the manual was to be arranged so that the reader could find what he wanted at a moment's notice by consulting the table of contents without going through a whole chapter or section.

Workers of our department pitched into the job. We drew up a structural draft of the projected manual, selected suitable illustrations to go with the text for a more graphic presentation. We sought to achieve the most effective and adequate form of presenting the anatomical material to make the manual an easy-to-use reference work for any medical man.

The first chapters were born in travail. The authors took one another to pieces, pointing out such shortcomings as too academic a presentation, too dry a style, lack of continuity, insufficiency of illustrations, etc. Some of the contributing authors had to rewrite their chapters several times. Docent Bomash and I gave them whatever help we could. Later on, the individual chapters were submitted for discussion by the students, post-graduates and doctors on the staff of our department. Work on the manual took all of ten years. During this time each contributor became an expert in his particular field and acquired new knowledge and experience. Some of them had attained a high professional standard and now worked independently. At last the topographical anatomy manual was completed.

Parallel with this major undertaking, I worked, in cooperation with Professor A. A. Travin, on another fundamental manual—on the surgical anatomy of the lower and upper extremities. Operative intervention on these are very frequent, and the need for such a manual was obvious. Any operation, however, requires a sound substantiation, not only from the standpoint of surgical technique, but also from the anatomic angle. The anatomic substantiation is a crucial factor, which often determines the nature of operative intervention and its outcome.

The aim of the new book was to furnish the practising surgeon with the basic topographico-anatomic data for the diagnosis and surgical treatment of the diseases of the extremities. This consideration determined our approach to selecting and preparing the necessary materials. What we had in mind was a clinical manual in surgery, containing up-to-date data on the surgical anatomy of the human limbs and based on our own anatomical research.

Dozens of artists took part in compiling the book. They sketched from nature the anatomical preparations already completed. Some of the artists, however, had considerable difficulty doing sketches, since they found it extremely unnerving to work in the mortuary.

Professor Travin and his assistants made a great number of anatomical preparations. I admired Travin's enthusiasm and perseverance. On many an occasion he had to make the same preparation over and over again until the artist had studied every

anatomical formation down to the last detail in order to reproduce it with absolute accuracy on a colour plate.

Two years of intensive effort passed. One day V. M. Bانشchikov, then director of the Medical Literature Publishing House in Moscow, paid us a visit. He had backed us throughout our work on the project and now decided to have a look at the illustrations for our manual. But we were in for a shock. After glancing through a pile of drawings Bانشchikov commented dryly, "This is not good enough. Just not good enough. You'll have to do the drawings all over again."

He rejected all but a few drawings. It meant that two years of hard work and sleepless nights had been in vain.

We were back to square one and had to start all over again. To make things worse we were down to two artists whose work was approved by Bانشchikov. They were Grzheshkevich and Belayeva who were infected with our enthusiasm and produced excellent drawings and colour plates. Later their work was highly praised at various medical book exhibitions.

Since our manual was designed primarily for surgeons, and particularly for traumatologists and orthopaedists, we showed sections of the manual to them as they were completed. Later we made a progress report to the surgical staff of the prestigious Vishnevsky Research Institute. We put up colour plates and drawings on the walls of the auditorium for every one to see. A frank and lively exchange of opinion followed. The surgeons praised us for the good job we had done but also complained that we had been rather too long about it.

Step by step the manual was pieced together. The first volume entitled *The Surgical Anatomy of the Pelvic Limbs* came out in 1963 followed two years later by the second volume *The Surgical Anatomy of Pectoral Limbs*.

One other subject our department worked on was the further perfection of the intra-arterial administration of drugs. Prior to World War II, V. I. Ivanov and I had worked on this method which was used with success in treating suppurative inflammations. During the war this method was used to prevent the onset of grave complications following gunshot injuries in the cranium and extremities. Today it is extensively used in the treatment of malignant tumours. A variant of it was developed—a prolonged intra-arterial infusion of drugs.

Over the past few years Professor Lubensky has been employing prolonged intra-arterial infusion to treat purulent processes in the lungs both in children and in adults. Very often, following this

course, operative intervention became unnecessary and the patients were discharged from hospital in good health. In other cases the subsequent operation was not as extensive as it might otherwise have been. Encouraging results were obtained in treating bronchial asthma and thrombo-obliterative disorders using intra-arterial infusion. Prolonged infusion has been successfully used as a preventive procedure against surgical infection in grave traumas of soft muscle tissues and organs.

But our department's principal line of research in recent years has been to further develop experimental surgery and organ transplantations. This is an extremely important area of medical research and we have committed considerable resources to exploring it.

For some time now the general public both in this country and abroad have been closely following progress in this field. This interest is understandable, because organ transplantation holds out great promise. We have already learnt to transplant skin, bones, retina, kidneys, blood vessels and the heart itself taken from dead people to save the life of those who would otherwise have been doomed. This field of medical endeavour attracts more and more seeking minds.

### **The Surgeon's Trusty Helpers**

The para-medical personnel including theatre nurses, anaesthetists and vivarium workers have an important part to play in the success of a surgical experiment. Very often the outcome of an operation and of an experiment is largely dependent on the efficient functioning of the operating unit, on the sterilisation of surgical instruments and materials, and the administration of the anaesthetic. Even an operation performed according to all the rules of antisepsis does not necessarily guarantee that the animal will survive, since this is largely dependent on post-operative care, which is perhaps the most difficult phase.

A major operation involving transplantation of an animal intestine, stomach, lung or kidney means sleepless nights for the surgeon and his assistants. They watch the dog round the clock, looking after it with loving care and feeding in with a spoon. Later, when the four-legged patient is strong enough to stand on its legs nurses will take it out for walks. One of them will knit a warm coat for it. The staff of an operating unit are all involved and this identity of interests brings them closer together and contributes to their ultimate success.

When I. A. Sychenikov was working on the use of antibiotics in the application of vasoligatures, he was elected secretary of our institute's Party committee. This inevitably meant devoting a good deal of time to Party work, attending meetings, preparing for them, and so on. Often during a meeting he would remember that he had something urgent waiting at our laboratory. He would ask one of his comrades to relieve him and dash into the laboratory where the nurses and others were waiting for him. He bore uncomplainingly the rather caustic comments from Galina Volkova, the senior theatre nurse.

Galina was one of the department veterans. Many aspirants to a scientific degree expressed their gratitude to her at the defence of the thesis for her aid in their experimental work. Before operations she helped them choose the right instruments, sutures and dressing materials, decide on the anaesthetic to be used and the dog to be operated on; she had acquired a good eye in these matters and could pick the right dog, knowing as she did from long experience which dog was strong enough to survive the operation.

Outwardly stern and shy, Galina was not much of a talker. It was difficult to draw her out. One reason for this perhaps was that she lost her parents at an early age. She looked after her younger brothers and sisters, and had her hands full, what with the housework and studies for entrance exams to an evening course at the school. Galina set a good example for our younger staff members and students.

Aunt Polya was another absolutely reliable and indispensable helper. Before the war she lived in a village where she had a family and a house of her own. When the war broke out and nazi invaders occupied her village her life was broken up. Her house was burned down, her children driven away into German bondage, while her husband was reported missing. She lost everything. Alone and heart-broken, she wept bitterly over the charred ruins of the house and decided to leave home. She hitch-hiked to Moscow where she took a job as a cleaner. Later she came to work for our department, where she was put in charge of the vivarium, which under her was transformed beyond all recognition. The rooms were spotlessly clean, the dogs well fed and groomed. They were all greatly attached to her. She could take a really vicious dog to the operating theatre and get it on the operating table with hardly any trouble. While she was around the dog would stay quiet and allow the experimenters to make a thorough examination, even with painful injections.

Aunt Poly and the surgeon in charge would keep watch over the dog that had undergone an operation and nurse it back to health. Whenever the dog was poorly Aunt Poly wrapped it up in a warm blanket and sat beside it talking to it as one would to a sick child. Later she would recount her observations to the doctor in detail, and the latter would record them in the logbook. If a dog did not survive the operation Aunt Poly got extremely depressed. This conscientious, kind-hearted and hard-working woman was a tremendous help to the experimenters. She and her like were truly invaluable.

### III. SURGERY AS IT IS

*I deem a single experiment to be of greater value than a thousand opinions born of the imagination alone.*

*Mikhailo Lomonosov*

#### The Eternal Search for Truth

A dead body always strikes terror in the living. The inscrutability of death clothes it in mystery. And although the wrinkles on the dead face, the traces of past suffering have been smoothed out, the bloodless face is no longer illuminated by the play of human emotions and the dead man's brain has died forever. What remains is the barren shell, which is sometimes beautiful while at other times horrid.

When a dead man is placed on the autopsy table and a pathologist dissects him, even after opening the dead man's cranium the pathologist cannot hope to gain an insight into the dead man's earlier thoughts and feelings. The dead body is totally unrevealing in this sense. But even so, the pathologist can learn a lot at an autopsy. The inscription on the pediment of the anatomical theatre in Paris, "Here death triumphs as it helps life" is very significant.

Whenever I have to dissect a body to demonstrate to the students the topography of human organs and tissues, I always marvel at its

perfection and the wisdom of nature. I am also filled with admiration for the courage of many successive generations of anatomists who, defying the obscurantist dogmas of the medieval clergy and undaunted by the prospect of ending their days at the stake laid the foundations of descriptive anatomy, that cornerstone of medicine in general and surgery in particular.

Gradually textbooks and atlases of descriptive anatomy were compiled. The anatomists compared everything that lent itself to comparison in the structure of the human and animal organs and in this way pieced together manuals and textbooks of comparative anatomy. They made a careful study of the relative location of the various organs and tissues. Today we have an extensive library of books on every aspect of topographical anatomy.

It would seem that the anatomists of today have little left to do. Indeed, over the past 10,000 years ever since the appearance of the Cro-Magnon man, no major evolutionary changes have taken place in man's physical structure.

The question arises: do we have to keep telling the students copy-book anatomical truths? The answer to that is an emphatic no. The quest for new knowledge is endless, and however carefully the anatomists of all times and trends studied the dead body and everything that is visible in it, no matter how far the histologists have penetrated the inner secrets of its structure, no matter how well the experts in electronic microscopy have studied the molecules making up the human cells, the data obtained to date are by no means the ultimate in our knowledge of the human body and not even an essential foundation on which to train surgeons. Not only because disease treacherously alters the familiar picture, messing up the relative location of the organs, welding them together with connective tissue, but also because even if you have demonstrated to the students the source or focus of pathology on the dead man's body it is not always possible to explain the course of the disease that killed him. The would-be surgeon, internist or neuropathologist must learn to dissect the living body, warm and full of life, with its blood vessels filled with a pulsating flow of blood as well as the dead. That is why experiments on lab animals form an obligatory part of the topographical and surgical anatomy course offered by medical institutes. The dog has been man's friend in more ways than one from time immemorial.

When I. P. Pavlov was once reproved for experimenting on dogs, he replied, "True, the suffering and violent death of animals despite the various humane measures taken by experimenters have not been eliminated. Can this be justified? I do not doubt that



without experiments and observations involving living animals man would be unable to gain an intimate knowledge of the laws of the organic world. This settles the question of the legality of vivisection finally and without appeal. If it is true that mankind still tolerates hunting which inflicts suffering and death on the animals for man's amusement, if it is true that animals are slaughtered in their thousands to provide food for humans, if it is true that humans themselves are slaughtered in war by the thousand and undergo incredible agony, does it make sense then to object to the sacrifice of animals in the name of the search for truth, that highest and loftiest aspiration of man."

A profound humanist, Pavlov insisted on every possible measure to relieve pain and avoid "all and every excess" during experiments on animals. At his insistence a monument was erected to the dog at the Physiology Institute in Leningrad with this inscription, "The dog, that helper and friend of man from prehistoric times, is sacrificed on the altar of science, but our sense of human dignity obliges us to ensure that this sacrifice is invariably done without inflicting unnecessary suffering". It is not only physiologists who study the workings of the living body that need experiments on lab animals. Surgeons and anatomists need them, too.

The order of sequence, whereby experiments on lab animals are followed by operations on human patients, appears to be a thoroughly logical arrangement. At times, however, life intervenes and reverses the sequence. When in the spring of 1635, Daniel Schwabe, the German surgeon from Königsberg, was confronted with a peasant who had accidentally swallowed a penknife, the question arose whether he was to operate immediately or whether he should let things take their course and hope for the best. At that time no operations on the abdominal cavity had been performed by anyone anywhere. There were no effective anaesthetics, nor any reliable protection from microbes (their existence was not even suspected). But his sense of medical duty prevailed and Schwabe took the plunge. He invited the members of the medical faculty where he taught to gather in the anatomical theatre, had the poor devil tied to a board and ignoring his heart-rending shrieks and groans slashed apart the abdominal wall, opened the stomach, got the knife out and stitched up the wound. The man survived. That was the first operation ever performed on the human abdominal cavity.

It was not until two and a half centuries later that surgeons began attempting operations on the abdominal cavity. But even in the early 20th century the removal of a suppurated appendix, let alone operations on the stomach and intestines, was a rarity.

In our own days the normal sequence was reversed again. While experimenters were busy exploring the possibility of transplanting kidneys, studying the viability of the transplant and conditions under which the kidneys were to be best preserved, life forced the surgeons to perform a kidney transplantation operation on human patients. What is more, experiments on lab animals cannot always be followed by operations in the clinic, since there is a good deal of difference in anatomical and physiological terms between a human being and an animal. Very often successful operations on lab animals cannot be repeated in the clinic on human patients and vice versa. Operations on the “dry heart” conducted with the aid of a heart-and-lung machine, have had a higher success rate on human patients than on dogs.

The use of the artificial kidney machine which filters away solids from the blood when the patient’s own kidneys fail is tolerated well by human patients but not by dogs.

This is not to say, of course, that we could do without preliminary experiments on lab animals. To this day they form the basis for further investigation in surgery and anatomy. The pathologists and anatomists of today have to carefully study the living and the dead body in order to evolve experimental models for new operations and explore new paths for further progress in surgery.

Even when it has attained unprecedented heights, surgery will still be a last resort measure in the treatment of patients. Who wants to remove the patient’s stomach when its disease can be cured by other means? Why remove part of the lung for TB or lung cancer, if it is possible to beat it by drug therapy? When the Roman scholar Celsus wrote that “the success of surgery derives from the weakness of medicine” referring to internal medicine, therapeutics, he was not too wide off the mark.

Medical scientists are now busy improving the conservative methods of treatment, and looking for more effective drugs to combat disease. As new and more advanced methods of treatment and disease prevention are evolved, surgical intervention will be resorted to less and less. There are strong indications that this is the current trend. The removal of the stomach and duodenum for peptic ulcer is now done only when there are special indications for this; ordinarily the disease can be cured by drug therapy and a suitable diet.

No operation involving the removal of a vital organ or part of it can be considered the best course of action in grappling with the disease. Whichever way you look at it, the removal of a vital organ

lowers the vigour and fitness of the patient and often leaves him a cripple for life. That is why medical men down the centuries have been searching for a way of giving a new organ or tissue to patients to replace one damaged by disease. Winston Churchill provided a good illustration in his memoirs of a replacement operation performed at the turn of the century; he gave a skin flap to an officer wounded during the Sudan campaign of 1898. This is what Churchill writes: "Molyneux had been rescued from certain slaughter by the heroism of one of his troopers. He was now proceeding to England in charge of a hospital nurse. I decided to keep him company. While we were talking, the doctor came in to dress his wound. It was a horrible gash, and the doctor was anxious that it should be skinned over as soon as possible. He said something in a low tone to the nurse who bared her arm. They retired into a corner, where he began to cut a piece of skin off her to transfer to Molyneux's wound. The poor nurse blanched, and the doctor turned upon me. He was a great raw-boned Irishman. 'I'll have to take it off you,' he said. There was no escape and as I rolled up my sleeve he added genially, 'Ye've heard of a man being flayed alive? Well this is what it feels like.' He then proceeded to cut a piece of skin and some flesh about the size of a shilling from inside my forearm. My sensations as he sawed the razor slowly to and fro justified his description of the ordeal. However, I managed to hold out until he had a beautiful piece of skin with a thin layer of flesh attached to it. This precious fragment was then grafted on to my friend's wound. It remains there to this day and did him lasting good in many ways. I for my part keep the scar as a souvenir."

At the turn of the century an operation of the type described by Winston Churchill was a rarity.

Today surgery has reached a stage where it is possible to perform major reconstructive and plastic operations. The surgeon no longer seeks to lop off or excise an organ, rather he tries to preserve it as far as possible and restore its function. Today surgeons have learnt to replace organs and tissues with biological substitutes, using synthetic materials or man-made prostheses. This stage in the development of surgery has its own prehistory, but of that more later.

### **Surgery and Technological Progress**

The bonds linking modern medicine with science and engineering are growing stronger every year. These days a surgical operation is a complex act which calls for the cooperation of

specialists in very different fields. A heart or lung operation requires the participation, apart from the surgeons, of anaesthetists who not only administer anaesthetics but also ensure controlled breathing, of specialists in extracorporeal circulation, who also keep a watch on electrophysiological and biochemical changes occurring within the patient being operated on. Engineers, chemists, electronics experts and specialists in other fields of knowledge have come to the aid of the doctors.



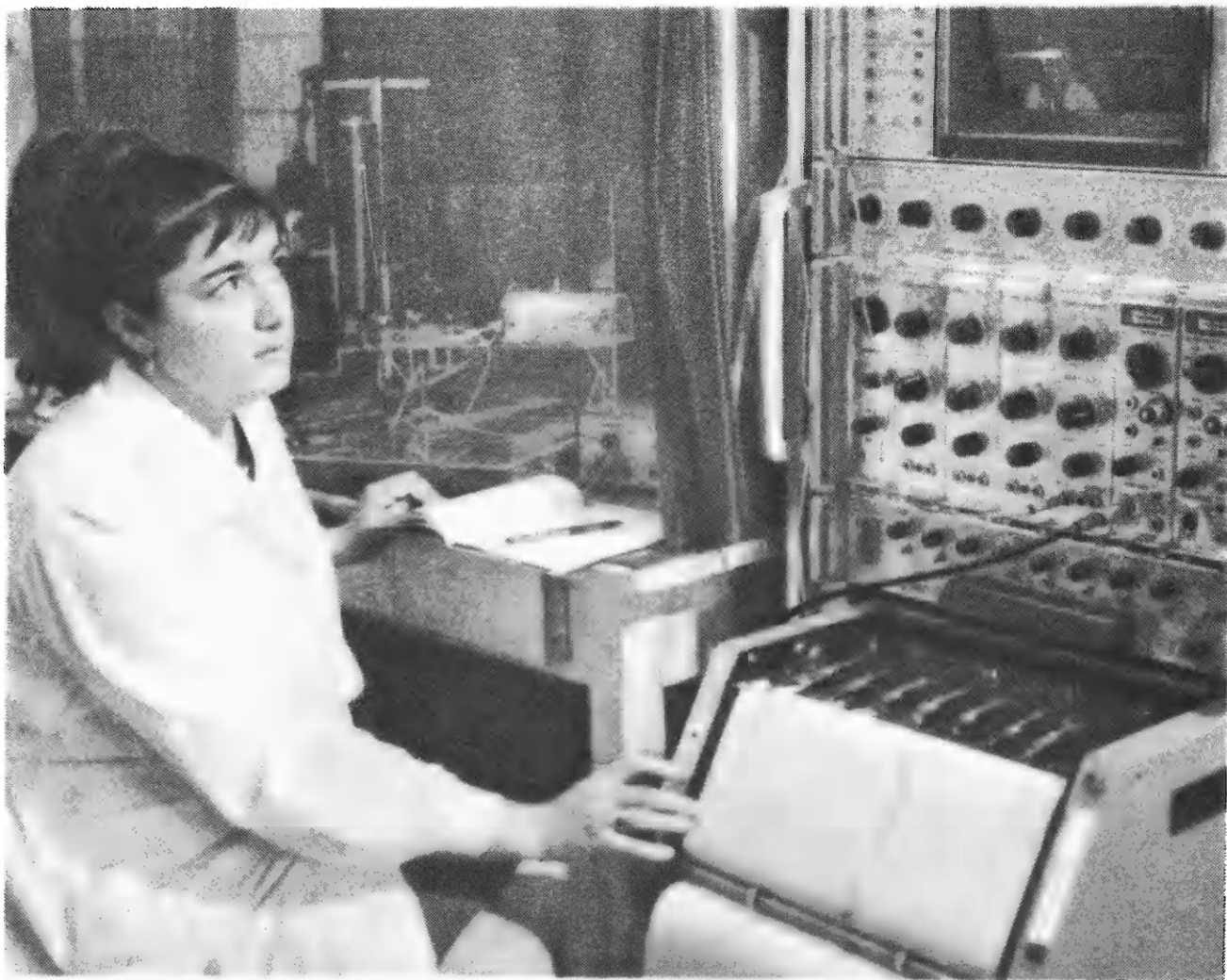
Joining blood vessels with a Soviet suturing apparatus



Filming cancerous cells behaviour with a micro-camera

Some of the more recent products of cooperation between doctors and engineers include the pacemaker, an electronic device used to correct weak or irregular heart rhythms. Another is the defibrillator which helps restore contraction of the cardiac muscle. There are artificial breathing machines, devices for registering the bioelectric potentials of the heart and brain (electrocardiographs and electroencephalographs). There are systems to keep a watch on the patient with detectors monitoring individual physiological functions which provide early warning of any disturbance. Finally, there is the heart-and-lung machine which, as the name implies, takes over from the patient's heart and lungs during an operation.

The idea of such a machine was put forward by Professor S. S. Bryukhonenko 30 years ago. He invented an ingenious contraption called "autojector", which was capable of inducing artificial blood circulation both throughout the body and within an isolated organ. The design of the machine was analogous to the circulation system of any warm-blooded animal. Two diaphragm pumps corresponding to the left and right parts of the heart were activated by electric motors and together functioned as a heart.



Complex study of bioelectrical potentials on the "Polygraph" apparatus

One pump drove blood through the arteries while the other pumped the venous blood out. To regulate blood pressure within the vessels and maintain normal blood temperature automatic regulators were used. For lungs, where the blood is enriched with oxygen, Bryukhonenko used a foam aerator (the modern name is oxygenator). The aerator was a wide cylinder filled with fresh blood through which oxygen-rich air passed under pressure.

These days medical engineers have developed different models of the heart-and-lung machine. Abroad the Melrose and Gibbon systems are prevalent. These machines are being perfected all the time. For all the sophistication of present-day heart-and-lung machines they still have the basic units of Bryukhonenko's original autojector, including the oxygenator (artificial lung) and pumps driving blood through the body (artificial heart). In 1965 in recognition of his services to medical science, Bryukhonenko was posthumously awarded the Lenin Prize for medicine.



The importance of Bryukhonenko's invention is indeed tremendous. Today heart-and-lung machines enable surgeons to intervene to correct just about every type of congenital and acquired heart defects. Surgeons can now switch off the heart for a long time, an hour and longer. Blind tactile and instrument manipulations inside the heart are successfully supplemented by operations on the open heart. Surgeons not only dissect and excise parts of the cardiac tissue but also reconstruct cardiac valves and aorta. Most of these operations both in this country and abroad are unthinkable without using heart-and-lung machines.

Bryukhonenko's other idea, about maintaining life in isolated organs, is also being utilised as organ and tissue transplantation becomes more common.

In our organ and tissue transplantation laboratory T. M. Oksman recently used regional (local) perfusion with the help of an extracorporeal circulation machine to check the viability of an organ prior to its transplantation and to correct ischemic disturbances that may have set in in the surviving organ.

It was found that giving an amputated extremity a regional blood perfusion, with preceding ischemia of up to three hours' duration (at room temperature), completely restores the metabolism and the organ's physiological function. With ischemia of a longer duration, up to 6 hours, the chances of correcting the disturbances diminish considerably. The degree of reversibility of the changes that have occurred in the organ from preceding ischemia can be established by the dynamics of muscular electroexcitability (i. e. contraction of the ischemic limb muscle in response to electric shock). Roughly speaking, if muscular electroexcitability has been retained, the impaired function can be completely restored. If muscular electroexcitability at the start of perfusion is absent, but later reappears, the impaired function can be restored partially. If muscular electroexcitability is absent both prior to and during a three-hour perfusion, the impaired function is lost forever.

Medical research has established that by adding papaverin and hydrocortison to the blood in the extracorporeal circulation machine one may influence some aspects of an organ's vital activity in desired ways.

Besides extracorporeal circulation, modern surgery now has advanced anaesthetic methods available using fully or semi-automated anaesthetisers. From early attempts to relieve pain by administering narcotic and sense clouding substances such as mandragora, indium, hemp, alcohol, etc. surgeons have arrived via ether and chloroform at the modern methods of anaesthesiology.

Today a patient may spend hours under an anaesthetic while doctors, using up-to-date equipment, control his breathing, blood pressure and composition of breathing gas mixtures.

The use of lasers in surgery and other fields of medicine is being intensively investigated. The laser is a device producing a light beam of tremendous intensity and power. Depending on the design of the optical quantum generator emissions can be intermittent or



Studying the action of an ischemic toxin on an animal





Treating diabetic retinopathy with the help of radon laser photocoagulator

sustained. Quick “shots” of light emission can be used to combat tumours. Continuous action lasers are used in a variety of surgical operations, the light beam acting as a knife to dissect tissues. In fact the use of a laser in this instance has advantages in that it not only excises damaged tissues but cauterises the minute blood vessels, thereby bringing bleeding down to a minimum. This property of a laser beam offers obvious advantages during operations on internal parenchymatous organs with their dense network of blood vessels. With the advent of lasers, the surgeon’s dream of bloodless operations has come closer to fruition than ever before.

Even now lasers are used to remove a variety of pigmented spots and tatoos. Laser beam welds exfoliated retina of the fundus oculi back into place and destroys ocular tumours. One other promising area for the medical application of lasers is to destroy malignant tumours. Experiments have shown that given the right choice of emission energy, light impulses generated by the laser in some cases completely destroy the tumourous tissue. Because of their lightening-like speed the patient feels no pain. There is every reason to believe that before long lasers will become another effective weapon in the surgeon’s arsenal.

Recently a new branch of medical science has emerged, resuscitation. It implies bringing a patient back to life from clinical death. A lot of credit for formulating the theoretical principles of the new science and introducing resuscitation techniques goes to Professor V. A. Negovsky. The laboratory he heads was the first in this country to evolve methods of resuscitation and to set up resuscitation units in different parts of the country. In the past ten years alone the personnel at the laboratory's clinical unit have saved a total of 2,400 patients. In recognition of their services, members of the laboratory and its head were awarded State prizes twice (in 1952 and 1970).

### **Hypothermy in the Service of Medicine**

Biologists and physiologists have established that hypothermy (cooling) of a warm-blooded organism drastically slows down metabolism. At the same time the tissues' oxygen consumption is cut sharply and in consequence blood circulation slows down. Physicians have often noted that bleeding can be arrested far more quickly when a wounded man has spent some time out in the cold.

Subsequent observations and physiological investigations proved that warm-blooded organism can be cooled considerably without risk to life. The explanation for this is that the temperature of a warm-blooded organism is controlled by a specific physiological mechanism, the main component of which is the so-called temperature control centre located in the hypothalamus. Pharmacologists have developed special drugs which weaken the activity of this centre. Body temperature can then be lowered by one or two degrees Centigrade and even further.

The patient duly anaesthetised and injected with a preparation weakening the activity of the temperature control centre is gradually lowered into a bathtub filled with cold water. When his body temperature has been brought down to 33 degrees Centigrade and lower he is taken out of the bathtub and icebags are placed all over him. In this way a decreased body temperature is maintained throughout the operation.

Special instruments monitor the patient's blood circulation, breathing and brain biological potentials. When the operation is over the patient is injected with preparations neutralising the effect of the original drug and is subsequently warmed with hot water bottles. Gradually his body temperature is brought back to normal.

Hypothermal techniques are perfected with each passing year. Today the patient's body temperature is lowered under special



Ultrasonic surgery

domes of organic glass. When the patient has been put under anaesthetic the domes are removed and the operation begins. Later when the patient's body has to be warmed the domes are replaced and filled with warm air. These hypothermal methods are used with modifications in heart operations lasting 10 to 15 minutes.

During an operation on a particular organ partial hypothermy is used where only the temperature of the organ operated upon is lowered. Partial hypothermy is used for operations on the heart and brain. After opening the thoracic cavity the surgeon puts sterile snow around the heart. The snow is a congealed physiological solution containing the same set of salts as the blood plasma. When the heart is stopped the surgeons "repair" it, warming it afterwards with hot compresses. Gradually the heart comes back to life. During long heart operations to replace a valve or correct a multiple congenital heart defect hypothermy is used in conjunction with extracorporeal circulation. In this instance the blood supplied by the heart-and-lung machine is precooled in a special chamber. Extracorporeal circulation with chilled blood can also be maintained in an isolated organ.

These techniques made it possible to perform many successful operations on the heart, brain and other organs. Medical scientists were anxious to find out the limit to which body temperature would be lowered. Life itself soon provided the answer to that question.

...The summer of 1967 in Japan was a real scorcher. During the heat wave a refrigerator truck with a cargo of ice cream arrived in Tokyo from Sapporo. While waiting for his turn to unload the driver decided to "cool down" a bit by climbing into the back of the truck for a quick nap. Several hours later when the truck's refrigeration chamber was opened by officials at the ice-cream storage depot they discovered the driver frozen stiff. The driver looked dead. But the doctors succeeded in bringing him back to life and good health. You may ask why the driver was not killed. The fact is that the gases given off by artificial ice put the driver under a kind of anaesthetic, whereupon he was actually quick-frozen alive.

There have been other cases just as bizarre. On March 26, 1960, the body of a frozen man was admitted to the mortuary of a local hospital in Kazakhstan. The body was picked up on the outskirts of a township. The physical examination revealed that on admission the body was frozen stiff inside ice-crusted clothing and did not exhibit any sign of life. When the examining physicians knocked on the body it produced a dull sound as if made of wood. The eyes were wide open and the sclera and iris were ice-crusted. No pulse or



At an electronic microscope



Studying the acid-alkaline balance in arterial blood on an ABC-1 apparatus

breathing was apparent. The diagnosis was clinical death from freezing. For all that, however, Doctor P. S. Abramyan took vigorous measures to bring the man back to life. He made the man warm and then stimulated his heart activity, giving him artificial respiration and massage. An hour and a half later the man came back to life. He was V. I. Kharin, a 29-year-old tractor driver. Afterwards he told his story. He was returning to his garage when a violent blizzard began. Suddenly the engine stopped. For two solid hours he tried to restart it but to no avail. He then decided to walk it to the township. At some point, utterly exhausted he lost his way and decided to take a short rest in the snow. The rest he could not remember. He spent approximately four hours in the snow slowly freezing to death. Kharin was hatless at the time and that, surprisingly enough, saved him. His brain was subjected



to an intensive chilling. The drastic drop in brain temperature kept brain nerve cells from impairment. That was the one factor that later helped the doctor bring him back to life.

The tolerance of the human brain to deep freezing is of utmost importance. Priority cooling of the brain makes it possible to ensure a moderate degree of hypothermy for the body, down to 30 degrees Centigrade, long enough for an operation on the "open" heart to take place. Using hypothermy of the brain, surgeons have been known to arrest blood circulation for half an hour and longer.

Artificial cooling alongside other techniques allows organs and tissues taken from dead bodies to be kept in cold storage for a long time for later be used in transplantation. This principle underlies the creation of what is known as tissue banks. The USSR has several tissue banks which supply the necessary tissues and organs

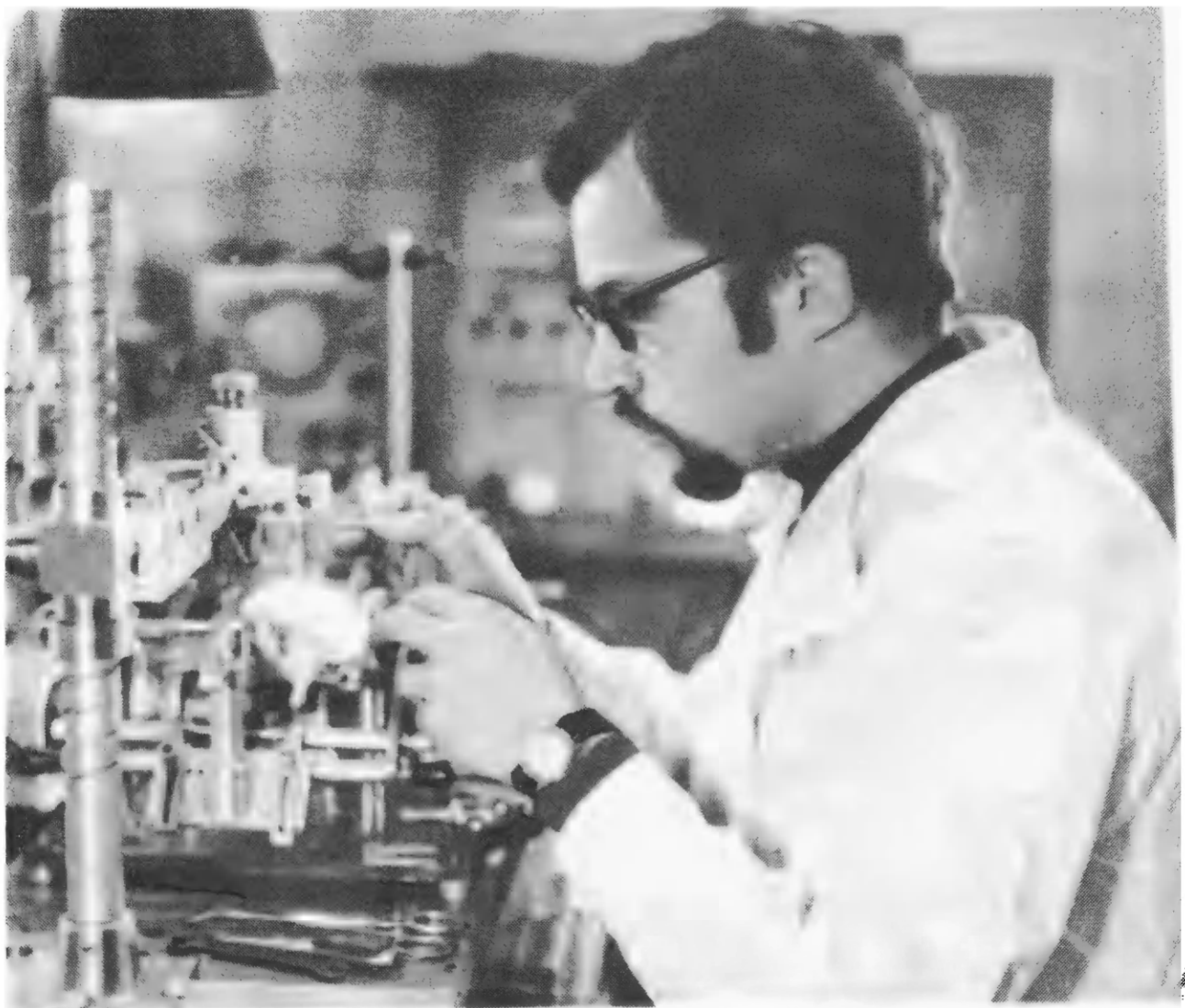


Examination with an amino-acid analyser

for transplantation. Normally organs and tissues are taken from the bodies of dead people. Few people are surprised today to learn that upon the death of an organism some tissues do not die straight away but remain alive for several hours afterwards. This property of human tissues to survive the dead body is used in organ transplantation. However, the idea of using cadaveric tissues did not win recognition overnight. The use of cadaveric tissues and organs for transplants was promoted by the practice of transfusing cadaveric blood to patients.

### **“The Blood of Your Heart...”**

In the mid-17th century the first attempts were made in blood transfusion. In 1667 Doctor Jean Baptiste Dennis reported a



Implanting electrodes in a rat's brain to study muscular activity in the stimulation of the reticular nuclei



successful transfusion of blood taken from a calf to a dog. Subsequently similar experiments were conducted on human patients. Unfortunately, in those early days they often resulted in grave complications leading to the death of the recipient.

During the next two centuries medical scientists unsuccessfully tried to find the cause of blood transfusion failure. It was not until the early 20th century that the picture began to be clarified. First Landsteiner in 1901, and later Jansky in 1907 identified four blood groups in humans. Blood incompatibility caused agglutination of the erythrocytes. Agglutination is caused by specific protein substances, antibodies contained in the recipient's blood serum.

In 1910, a major advance was made, when Griffeld discovered that the erythrocytic proteins of different blood groups contained two substances labelled A and B, which he named erythrocytic antigens. The various combinations of these antigens and antibodies determine the existence of four blood groups in humans. If, for instance, a sick recipient with A antigens receives blood from a donor with B antigens, the anti-B antibodies attack "the strangers" causing their agglutination followed by their destruction. The recipient's organism is then inundated by toxic byproducts of the disintegration of the foreign erythrocytes. Grave complications result, often killing the recipient. For a blood transfusion to be successful, due account must be taken of the A and B antigens.

For many years after unlocking the mystery of the antigen composition of human blood only blood taken from living donors was used for transfusion purposes. The living donor to this day is an indispensable source of blood for transfusion. However, Professor V. N. Shamov, one of the top blood transfusion experts in the USSR, spoke of the possibility of transfusing cadaveric blood as early as 1928. Many of his colleagues strongly opposed the idea regarding it as sacrilegious. But in March 1930, as I mentioned earlier on, Professor S. S. Yudin transfused cadaveric blood to a victim of an automobile accident who was admitted at Sklifosovsky Institute in Moscow. The man survived.

S. S. Yudin, helped by his pupils, persevered in developing his idea both experimentally and clinically. It had enormous scientific and practical implications. Transfusing cadaveric blood shocked and disgusted the lay public and many in the scientific community for a variety of pseudoscientific and ethical reasons. Nonetheless Yudin finally got his method recognised and approved.

The advantages offered by the use of cadaveric blood are obvious. Cadaveric blood does not coagulate for a long time and can be stored at a temperature of three to four degrees Centigrade for up to 25 days without losing its biological properties. Further, cadaveric blood does not require any preserving additives and causes fewer negative reactions than stored blood taken from living donors.

Previously it was held that a dead man's blood contained ptomains which could kill the patient if introduced into his bloodstream. S. S. Yudin debunked this fallacy by a series of successful transfusions performed at the Sklifosovsky Institute in Moscow. True, on those occasions he used blood taken from the bodies of previously healthy individuals who had been killed in industrial or street accidents.

Prior to transfusion, cadaveric blood was submitted to a careful laboratory analysis to hedge against the possibility of transmitting a dangerous disease to the patient.

Later S. S. Yudin summarised his many years' experience with cadaveric blood transfusions in a monograph. The significance of Yudin's work went beyond the discovery of a new major source of blood for transfusion purposes. It proved the possibility of using organs and tissues taken from dead people for purposes of transplantation.

### **Bones Are a Living Tissue**

Excavations of burial sites have revealed that physicians of antiquity were able to patch over cranial injuries sustained by warriors in battle with gold and silver plates. In tropical parts of the world coconut shell was even used as the material for repairing holes in the skull. In 1860 Meekeren for the first time in medical history successfully used animal bone for closing cranial defects. Later surgeons began to use all manner of materials for similar purposes.

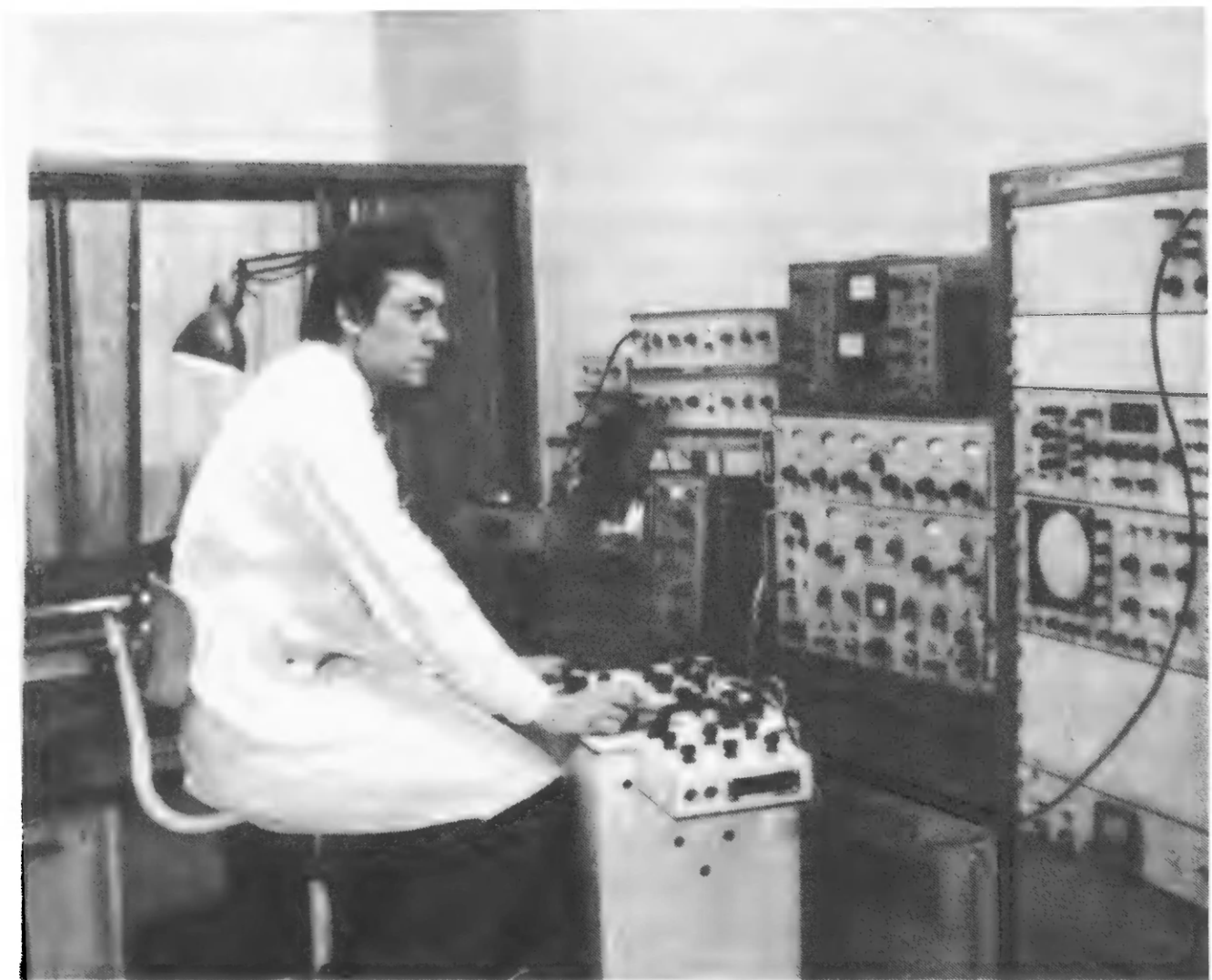
However, those crude operations often ended in failure. In many cases the bone transplants were rejected by the organism. For a time surgeons refrained from using biological materials for closing skull defects. In 1852 N. I. Pirogov, the celebrated Russian surgeon, performed the first osteoplastic operation to repair a grave foot injury. To make a supporting stump Pirogov cut out a skin and bone graft containing part of the heel bone and then applied it to the cut made across the shin bones making them fast

with sutures. Subsequently, the inserted part of the heel bone was grafted into the shin bone and served as a good support for the invalid.

That operation represented the first step towards restorative surgery. In later years bone transplants using the patients' own bones became common. The surgeons did not use the whole of the bone however taking only the part necessary to replace the missing part. This economical autotransplantation did not disturb the normal blood circulation.

But even when the operation was a complete success the patient inevitably sustained an additional trauma. Besides, this technique precluded the possibility of patching over extensive defects. Moreover, in some cases a retrogression set in, the bone being eventually resolved and the defect reappearing.

The search for more effective plastic techniques prompted surgeons to use tissues taken from animals. But here too the experimenters drew a blank. The tissues taken from animals were rejected in 40 per cent of the cases.



Processing neuro-physiological data on a computer

Tissue transplantation from one man to another remained an unresolved problem. But the surgeons struggled on.

In studying every aspect of osteoplasty and the experience of earlier surgeons, medical scientists recalled perhaps one of the oldest methods of preserving tissues keeping them in liquid media. Indeed, it was tempting to try to create conditions of preservation close to natural physiological ones. This method was comparatively inexpensive and did not call for cumbersome apparatus. The question was which substance was the best conserving agent. It was found that weak concentrations of formalin were supremely suited to the purpose. Numerous investigations established that bones treated with a formaldehyde solution retained their viability for prolonged periods. Experiments showed that formaldehyde solutions left the cellular structure intact and did not affect the physiochemical properties of the bone. What is more, a homotransplant treated in this way stimulated new bone formation from the surrounding tissues, itself participating actively in this process and generating fresh bone tissue. This makes it possible to close up extensive defects.

Weak formalin solutions were used extensively to preserve other tissues, including skin.

At the International Congress of Surgeons held in Moscow in 1971, Soviet medical scientists reported a new ingenious method of "repairing" damaged bones by ultrasonic welding. Electric oscillations from a special generator are converted into mechanical ones which are conveyed by the acoustic unit to the site of the operation. Ultrasound can both cut and weld. Using an ultrasonic knife the surgeon is able to recreate bone tissue out of minute fragments as well as weld together fractured bones. Needless to say, this property of ultrasound has an enormous practical importance for traumatologists.

Ultrasonic techniques are also used for operations involving the cutting of muscular tissues and bones. Ultrasound makes the operation quick and easy, enabling the surgeon to reach difficult-to-get-at regions. The use of ultrasonic cutters with their minimal tissue damage makes possible "clean" and radical removal of bone tumours and the foci of suppurative inflammation.

Academician M. V. Volkov, and Professor V. I. Petrov and their team won a State Prize in 1972 for developing and introducing ultrasonic techniques into general use for tissue cutting and bone welding following fractures, as well as in orthopaedic and thoracic surgery.

## IV. A MAJOR PROBLEM IN MODERN SURGERY

*Ardent faith in the power of science is not simply a supremely positive and valuable quality, without this faith it is impossible to advance scientific progress.*

S. S. Yudin

### “Professor Dowell’s Head”

Back in the 1930s bookshops in the Soviet Union did a brisk trade selling A. Belayev’s *Professor Dowell’s Head*, a science fiction novel.

“Loran turned her head and suddenly saw something that made her start as if from an electric shock. An isolated human head, minus the body, was quietly staring out at her. It was fixed to a square glass board resting on four tall shining metal legs. Twin tubes passed through the glass board linked the severed arteries and veins with something that looked like compressed gas containers. The thicker tube connected the head’s throat with a larger cylinder. The gas container and cylinder had an array of manometers, thermometers and some other instruments Loran could not place. The head, its eyelids blinking, was looking at her with interest and sadness. There was no doubt about it: the head though separated from the body continued to live an independent and conscious life. Having overcome the stunning impact of the horrible spectacle, Loran was surprised to notice that the head showed a close resemblance to that of the late Professor Dowell, an eminent surgeon who had won fame with his experiments involving revivification of organs taken from fresh human cadavers.”

The public shuddered as they read this. Yet A. Belayev had not thought his theme up entirely on his own—it had been suggested by Professor Bryukhonenko’s experiments. In May 1926, the delegates to the Second All-Russia Congress of Physiologists were shown a living dog’s head separated from its body. The head lived for an hour and forty minutes thanks to the use of an autojector. Needless to say, this experiment stunned the audience.

The idea of keeping an isolated organ alive has since been developed further and backed up by spectacular experiments.

Different workers followed different ways. One of them, the Soviet experimenter V.P. Demikhov took an ingenious approach. He has succeeded in achieving a long-term acceptance of a head transplanted from a puppy to the neck of an adult dog. This was made possible by a complex operation in the course of which the aorta and vena cava of the donor puppy were connected to the large blood vessels of the recipient dog's neck. The blood vessels were connected in such a way as to ensure the uninterrupted circulation of blood within the transplanted head. Upon linking the blood vessels of the recipient and donor, the puppy's heart and lungs along with some of its internal organs and a major portion of its body were removed. The blood circulation in the transplanted head and the front part of the puppy's body was maintained with the blood of the recipient. Whereas in the experiments performed by Bryukhonenko and Chechulin the isolated head was fed artificially and responded only to strong stimulation and did not live longer than a couple of hours, in Demikhov's experiment the transplanted head lived for up to nine days.

Here is what Demikhov himself writes: "When the recipient dog recovered from anaesthesia, the transplanted puppy head awakened with it. The first thing that struck the observer was the complete retention of all the transplanted head's vital functions. It exhibited a lively interest in its surroundings, and the eyes had an intelligent expression. The head looked at the people approaching it and licked its lips when it saw a saucer filled with milk. When offered milk or water it lapped it up hungrily. When a finger was offered carefully and tactfully the head licked it and when irritated bit the finger viciously. When the recipient dog got up and caused the puppy head discomfort and pain the transplanted head bit the ears of the recipient dog. When the room temperature went up (as for instance during filming with jupiter lamps full on) the transplanted head hung out its tongue and its breathing quickened. Similar, but not synchronous, movements were made by the recipient dog.

"The transplanted head fell asleep irrespective of whether the recipient dog was awake or sleeping. With an increased appetite in the recipient dog, the puppy's head also felt hungry, licked its lips at the sight of meat and ate it when offered. The puppy's head also controlled its forelegs which had been transplanted along with it. At times their movements resembled running."\*

A few days after the operation, however, an edema developed and the blood circulation was upset. The tissue edema in the

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\*V. P. Demikhov, *Transplantation of Vital Organs in Experiment*, Moscow, Medgiz, 1960, pp. 144-46 (in Russian).

transplanted head became increasingly visible three or four days after the operation. In another two days it reached considerable proportions. So much so, in fact, that the transplanted head was almost spherical in shape, the eyes swollen into slits and the tongue fell out of the dog's mouth. When pressed with a finger the dog's skin dented.

The "foreign" head had to be removed to save the recipient dog. Out of scores of transplants only one head retained its functions for as long as 32 days.

It is hard to say at this stage why in some cases transplanted heads live eight to 10 days while in other cases over 30 days. Apparently in the latter case a close tissue affinity between recipient and donor coupled with a fortuitous compatibility of blood groups inhibits the rejection.

True, Professor Robert White of the USA once reported a sensational success when for two days an isolated chimpanzee brain maintained its function. The success came after more than 60 experiments had ended in failure, though.

To begin with the isolated brain functioned for under an hour. Later, as the experimental technique was improved and more favourable conditions for the experiment created, the brain functioned for an increasingly longer period. Professor White's experimental findings are in many respects similar to the results of head and heart transplantation operations performed by V. P. Demikhov on dogs. Apparently it will be impossible to prolong the life of an isolated animal brain for much longer until satisfactory answers are found to many problems relating to tissue incompatibility. Then again it should be remembered that Professor White's experiments did not involve brain transplants from one individual to another.

A later experimental model for the transplantation of canine brain involved removing the brain from the cranium and putting it into a special subcutaneous pocket prepared on the recipient dog's neck. This operation is performed on a chilled dog, with its body temperature as low as 28-29 degrees Centigrade. An extensive cut is made in the dog's skull, followed by section of the spinal cord, after which the brain is taken out and fixed on a special site prepared in the recipient's neck. The central end of the common carotid artery of the recipient is linked by a U-shaped cannula to the carotid arteries of the transplant while another cannula is linked with the cardiac ending of the recipient's jugular vein. Throughout the experiment anti-coagulants are injected to prevent the formation of clots and venous thrombosis. Brain function is

evaluated from biological potentials recorded by special instruments and also from the oxygen and carbon dioxide content of the blood. For this purpose special catheters are used linked to the arterial and venous systems of the transplant.

The maintenance of metabolism is crucial evidence of life. The brain “breathes”, that is consumes oxygen and gives off carbon dioxide. Special automatic recorders testify to the presence of biological potentials. An isolated brain maintains some of the physiological functions peculiar to the brain in its natural environment and in this sense it may be said to be alive. But does the isolated brain perform its main function, does it think and does it have a consciousness? Apparently it does not. To enable the isolated brain to retain its thinking function it is necessary to maintain an inflow of innumerable neural impulses supplied by the sense organs, muscles and viscera. But no such simulation of neural impulses was attempted in Professor White’s experiment. That is why it is too early yet to speak of a full-blooded life for an isolated brain in an experimental environment.

Let us now attempt to answer another question. Now that experimenters have succeeded in creating artificial conditions maintaining the biological life of an isolated brain will the next step be the transplantation of the brain from one individual to another (animal or human)? Technically such an operation is quite feasible even today. But there is the problem of regeneration to solve. Regeneration is the restoration of the conducting pathways within the central nervous system. The brain is linked with the body by an enormous number of neural conductors which pass through the spinal cord. The experience of the experimenters and clinicians indicates that severed neural links of the brain and spinal cord cannot be restored. This is a serious obstacle to brain transplantation. Even transplantation of the brain together with the spinal cord is unlikely to yield positive results. The restoration of the nerve fibres’ conductivity following the severance of the radicles of the spinal cord is extremely unlikely. Therefore it is necessary to overcome the “regeneration barrier” before the transplantation of the brain alone or with the spinal cord can be attempted with any hope of success.

Needless to say, surgeons will have simultaneously to solve the problem of tissue incompatibility which in these operations will take a specific form distinct from the tissue barrier that has to be overcome in transplanting internal organs. To sum up, then, brain transplantation from one individual to another is up against formidable problems.



It is difficult to say at this point whether the experimental findings obtained by Bryukhonenko, Demikhov and White will ever have any practical and clinical application.

It should be noted, however, that some medical scientists consider it possible to achieve a continued existence of a man's head severed from his body even today, or at least in the very near future.

The question is whether such an existence, even given the retention of the thinking capacity is justified and at all tolerable.

There exist different forms of life, including rudimentary, elementary and higher, the latter peculiar to man and human society. Modern science proves that the thought process is the supreme manifestation of man's vital activity. The existence and development of human thought is the result of two organically linked factors: biological (brain matter) and social (the totality of social conditions surrounding man). While the two factors are in unity it is the social factor that plays the dominant role.

As for animals' rudiments of thinking ability, these are the product of biological laws alone. There is ample evidence supplied by zoo-psychology that the rudimentary thinking processes in animals, even though they are remotely akin to man's, cannot be regarded as anything more than something in the nature of a preliminary to the emergence of thinking as we know it.

The foetus in the mother's womb follows the laws of the development of its species and therefore reflects, in a way, the successive stages in the development of man and his society. The rudiments of thinking are formed simultaneously with biological processes involved in vital activity.

Humans become humans in so far as they live in a world of other people like themselves and enter into many different relations with them. Thinking would be impossible without communication with other people. Everything that is noble or base in man, his genius and villainy—all this is the product of life in society, all this has been brought about by communication with other people. That which nature has bestowed is shaped, moulded and developed in society. Human thinking in its nature, form and content is not only a biological but a social product. The brain is only a biological prerequisite of thinking. It is society that translates this potential into a real force. Man's inner world is a world of social relationships into which he has entered.

Further, in studying the complex world of the human psyche, one has to proceed from the integrity and wholeness of the human

body and the close interaction of all its vital processes. Thinking, consciousness and mental activity occur thanks to the brain, that wonderful organ both in terms of complexity and expediency. Thinking as a mental activity is made possible by the fact that man responds to the world that surrounds him. And he does so not only through his brain but with all his being. The point I am trying to make is that a person's brain separated from its owner cannot think because the thinking is done by the person through or with the help of his brain. He is able to think not simply because he has a brain to think with but because he is a human being, a whole and closely integrated and incredibly complex living being.

The world surrounding a human being is reflected in his thoughts and feelings both consciously and subconsciously. This conscious and subconscious perception of the world creates a complex and motley picture of human psyche of which thinking is an essential component. Thinking springs from the dialectical interrelation of the conscious and the subconscious, of volition and emotions, memory and sensory perceptions. In the living process of man's exceedingly complex mental activity we rather artificially single out thought processes in order to discover its laws and peculiarities.

Hegel once said that "nothing that is great is ever born without passion". Even the most insignificant and petty human thought is always coloured with emotion. Therefore, to assume the existence of thought separate from the human being, in an isolated brain, is tantamount to accepting that thought is born out of nothing.

Finally, I believe that an isolated human brain cannot think if only because the final ultimate source of man's spiritual life is creation. Human psyche and thinking spring from a special kind of information which originates in human work. Man is the maker of his own world. Herein lies the source of human thinking.

The question arises: how is an isolated human brain expected to think? Even if we assume the existence of elementary forms of vital activity occurring within this brain it is still absolutely impossible to imagine it being conscious. Thinking in the usual sense of the word will be beyond it. The situation will not be changed much even when the isolated human brain is given an artificial supply of information. In this case it is conceivable that some aspects of human thinking can be reproduced but even so the resultant thinking will be artificial as it will be governed by the purposeful activity and will of the human beings conducting the experiment. In this case an analogy with electronic computers and similar devices would seem to be quite in order.

## **The Dog's Fifth Leg**

In the summer of 1959 a young man with a severe injury was admitted to the Sklifosovsky Institute in Moscow. When the examining doctors unbandaged his injured arm they saw that the hand was all but torn off, with only a tenuous skin flap connecting it to the forearm. There was no time to be lost and P. I. Androsov, the surgeon in charge, made a quick decision. A careful examination of the trauma revealed that the cutaneous circulation was still maintained. After treating the surface of the wound surgically, he restored the links between the muscles, blood vessels, nerves and bones covering the whole with a skin flap. Gradually, the blood circulation in the hand was restored and it became warmer. The bones eventually grew together, as did the muscles and vessels. However, restoring the hand's function took a long time and prolonged exercises.

A similar case was described by the American surgeon Ronald A. Malt. In 1962 a 12-year-old boy was admitted to a Massachusetts hospital. The boy's hand was torn off as high as the upper third of the humerus bone in a train crash. The boy was admitted 30 minutes after the crash. While he was being brought back from shock and prepared for the operation the torn-off arm was put on ice. Its blood vessels were then rinsed with physiological and other nutrient solutions. The surgeon connected the larger vessels and, using a special device, linked the bones, found the nerve endings and marked them without however stitching them together. He then proceeded to treat the muscles. After getting rid of the crushed tissues he stitched up the muscles and sutured the wound. Six months later when the wound had healed and no infection was detected, the boy underwent a second operation to join up the larger nerve trunks. After a further six months all the fingers of his hand had completely regained temperature and tactile sensibility. Ronald Malt attributes the successful outcome to the relatively short time that elapsed between the trauma and the operation and the radical surgical treatment of the wound.

There have been other cases just as dramatic since. In 1963 the Chinese surgeon Cheng replanted a completely severed hand that was left without blood circulation for four hours. The hand eventually regained its function completely.

Some years ago, while in Shanghai, I visited the Sun Yat-sen hospital where Cheng worked at the time. The Chinese surgeon was very confident. His success made him famous, and he was well known throughout China. I was shown his former patient. The

operation was indeed a rare success. The surgeon had succeeded in restoring the patency of the small blood vessels, ensuring an adequate blood supply to the hand, connecting the larger nerve trunks and restoring their function. Eventually the patient, a locksmith by trade, was able to resume his former occupation.

However encouraging individual successes may be, they cannot provide any guarantees. A lot remains to be done before restoration of a severed extremity can become a routine operation involving no risk to the patient. I am not speaking here about the incomparably more difficult and more responsible task still waiting to be solved by surgeons—that of transplantation of extremities from one individual to another and from a dead man to a living patient.

Our immediate task today is to develop safe methods of replanting torn-off extremities. Experiments on laboratory animals have to be continued until such methods are found. We still know little about the clinical, biochemical, physiological, morphological and other changes occurring in the organism following the replantation of an extremity. One of the problems our laboratory is working on is why experiments involving the transplantation of extremities still fail. Which factors are the decisive ones and which are of secondary importance? For how long after the amputation should replantation be attempted and at which point it is useless to try?

To thoroughly explore this problem and find answers to these questions I included several biochemists, morphologists and physiologists into the team assigned the study of replantation problems. The surgeons developed and tried out experimental models, bringing them close to actual clinical conditions. Other specialists, on the basis of the new data obtained, formulated their recommendations. Later, we met to discuss the findings.

The replantation team was headed by G. S. Lipovetsky, a hard-working, dynamic and resourceful experimenter, who had successfully defended his doctorate on replantation a short time before.

The experiments involved the amputation of a dog's hind leg with its subsequent replantation at varying intervals. The experimenters did everything the way they would if they were confronted with a human patient with a severe injury sustained, say, in a road accident. They joined the big blood vessels, nerve trunks, bones, muscles, tendons and the skin.

It was found that a replantation performed from one to six hours after the severance was successful and the post-operational

period did not bring any severe complications. True, a lot of time and effort was required to achieve complete acceptance of the replanted extremity and to get the dog to use it as easily as before the operation.

However, with human patients, it is very rarely possible to perform the operation within this time limit. The scene of the accident may be far removed from the nearest surgical department. Then again, lack of facilities and the right sort of specialists on the spot coupled with the grave condition of the victim and other factors may considerably lengthen the ischemic period of the extremity. Therefore, in our experiments we prolonged the interruption of blood supply to the severed extremity up to 24 hours. However, every replantation after such a long period ended in failure.

The dogs died one after another. We picked the strongest dogs we had for the operation and did the work of replantation as thoroughly as possible. We kept the dog operated upon under constant observation, but all to no avail. Nor did the preservation of the amputated extremity at a temperature of two to four degrees Centigrade help much.

Those engaged on the project were losing hope. We analysed each experiment trying to establish the cause of the dog's death. We went back to previous experiments, compared the findings, argued ourselves hoarse.

A special team was set to study the muscle condition of the amputated extremity. It was found that after 24 hours the muscles of the amputated extremity had a high toxicity level. If a tiny bit of such a muscle was pulverised and placed in a centrifuge and then 0.5 ml of supra-sedimentary fluid was injected into the vein of a mouse, it died instantaneously.

It was clear that as the period of ischemia lengthened, the amputated extremity, deprived of its blood supply, acquired toxic properties. The question was how to preclude or at least weaken the level of toxicity. We performed a long series of experiments to find the answer. The blood vessels of the extremity were perfused with a cold solution shortly after amputation to remove blood clots. We then placed the extremity in a sterile environment inside a special preserving apparatus. Twenty-four hours later we took the extremity out and perfused it again in order to wash away any toxic substances, restore metabolic processes and warm it. And again failure resulted. A high percentage of the dogs died. Those that survived had an extremely difficult post-operational period attended by grave complications.

Once again we studied the evidence of the numerous electrocardiograms, encephalograms, pulse curves, arterial pressure charts and the data of the biochemical and physiological tests. More heated debates and arguments. We were determined to beat the problem.

Help came from an unexpected quarter. In fact, it was the proverbial fifth leg a dog is said to have no need for. At some point in our experiments someone suggested trying to give a healthy dog that has not been weakened by the preceding amputation, anaesthetic and other manipulations an added extremity taken from another dog 3, 6, 9 and 24 hours after amputation.

The next few days, whenever I came to the laboratory late at night, I found the whole team working hard. They staged an average of two to three experiments a day, and it should be said that experiments involving the amputation and replantation of an extremity involve a lot of hard work. After the dog was given a fifth leg it was placed under constant observation. Members of the team compared the composition of the outflowing venous blood with that of the inflowing arterial blood in the transplanted extremity. Simultaneously changes in the dog's blood composition, kidney function, cardiac system, breathing, etc. were monitored.

The data obtained enabled us to develop effective treatment for the dogs during the post-operative period and ensure their survival after replantation of an extremity that had been ischemic for 24 hours.

The first series of investigations were completed. We had established the entire complex of alterations occurring after replantation which we called "the syndrome of extremity replantation". However, the problem of shock caused by toxic products entering the blood flow from the ischemic extremity remained unresolved. What was the nature of this phenomenon? This question had interested me even before the war when I worked with Burdenko. Now T. M. Oksman was to tackle it. In specialist literature there were wide differences of opinion about the nature of ischemic shock. Some authors, both at home and abroad, thought that it was due to the accumulation of various toxins in an organ deprived of blood for a long period. Others held different views. For instance, the American surgeon Malt thought that the animal died after replantation due to the catastrophic loss of blood plasma and disturbances in the acid-base equilibrium. Tatyana Mikhailovna Oksman plunged into experiments. In an effort to remove the danger of post-operative shock she decided to try hypothermy. The dogs were cooled during the operation. The

mortality rate went down but even so no clue was forthcoming to the cause of post-operative shock. The failures plagued Oksman until she decided to try a model involving a fifth leg. In one experiment a leg cut from one dog was replanted three hours later on another, healthy dog. Soon the toxin coming from the extra leg produced a shock condition in the healthy dog. It was found that the longer the period between amputation and replantation the graver the shock.

The experimental findings confirmed a toxic origin of post-operative shock. The next step was to obtain the toxin in pure form. Here Tatyana Mikhailovna was helped by Mikhail Dalin, an experienced immunologist, and a former fellow-student of mine. Dalin worked at the Mechnikov Institute of Vaccines and Sera. When told about her experiments, Dalin showed great interest and offered to help. Together they spent 18 months tracking the toxin down. In the process they developed novel procedures which they later patented. Experiments followed in quick succession until the elusive toxin was isolated. It was an albuminoid with a low molecular weight. When minute quantities of the toxin are injected into an animal death follows at once.

After finding the ischemic toxin, we started developing a method to expel it from the organs prepared for transplantation. Now that we knew that post-operative shock was caused by an extremely potent toxin which develops in an organ deprived of blood for a prolonged period, we were better equipped to fight the grave complications.

Still some questions have remained unanswered to this day. In particular, we still do not know the toxin's chemical structure and the mechanism leading to its formation and accumulation in the tissues.

Replanting an extremity is a long, labour-consuming and technically complex operation calling for extremely delicate manipulations. Only a surgeon thoroughly proficient in the joining of bones and muscles, vasoligature techniques, and neural suturing can perform a successful replantation operation.

### **The Tissue Barrier**

In its early days restorative surgery confined itself to autotransplantation, using the patient's own tissues. There were good reasons for this, since attempts at transplanting tissues from one individual to another (homotransplantation) had nearly all ended in failure. Still there is evidence indicating that trans-

planting tissues or organs from one individual to another or from an animal to a human (heterotransplantation) have been attempted at the dawn of human civilisation.

In India, for instance, the first attempts at skin grafting were made several millennia ago. At that early period physicians knew that the patient's own skin was accepted readily. Before transplanting it, the skin flap of the donor was beaten until it expanded and became soft. To make it "stick" better a special preparation was used whose formula was a closely-guarded secret which unfortunately was later lost.

Available historical evidence suggests that even in ancient times physicians knew about the conflict that develops between recipient and transplant.

The opening years of the 20th century saw the first steps in another form of transplantation—blood transfusion. As I mentioned elsewhere it was found that human red blood corpuscles contain antigens and the blood serum, anti-erythrocytic antibodies. For a blood transfusion to be successful a suitable donor whose antigens are compatible with those of the recipient must be found.

The conflict which develops in homotransplantation of foreign tissue and in blood transfusions springs from the incompatibility of the donor's and recipient's antigens.

To date more than 30 antigens have been identified in human blood. Different people have different combinations of antigens. Why? Geneticists tell us that the antigens of a person's erythrocytes are immutable, being formed in the embryonic period. Their structure is inherited from the child's parents. But the antigen combination is peculiar to each person. Thus, if parents have both antigen A and antigen B their children would have different combinations of these antigens, with one child inheriting A antigens only, another inheriting B antigens, while a third child may have both. The total amount of antigens in an individual is enormous. We have only mentioned erythrocytic antigens. It is easy enough to imagine what a mind-boggling number of antigen combinations is possible.

To sum up, then, there is, on the one hand, antigen immutability, and on the other, an infinite variety of their combinations. Now, what is the implication of this variability of antigen combinations? It appears that thanks to this variability there appears a strictly individual set of antigens with which the defensive immunological organs of each person "make peace".

This is one form of what is known as the tissue barrier. Nature has marshalled a whole army of "defenders" to maintain and



safeguard this barrier. It is the human body's lymphatic system which effects the immunological protection of the organism. The system comprises stable elements, such as the spleen and lymphatic nodes, backed up by mobile elements including lymphocytes, plasmatic cells, and leucocytes the latter possessing the phagocytic ability to engulf any foreign particles. Each of these cells has its own duties. They are still to be studied fully and the mechanism of their interaction is yet to be determined.

The first riddle to be unravelled is just how the lymphatic formations recognise foreign substances? One assumption is that the phagocytes play a leading role in this, being the first to make contact with the foreign antigens, engulfing and digesting them. Later, according to some investigators, the phagocytes contact the lymphocytes, boosting their numbers rapidly. The latter, too, attack the foreign antigens. Their plasmatic cells also join the fray. These supply specific albumins, known as antibodies, hostile to foreign antigens. This immunological protection complex is complemented by certain other systems, which also generate special substances making for closer cooperation between the organism's own lymphocytes and antibodies with foreign antigens and thereby speeding their destruction and expulsion from the organism.

Even this sketchy description gives some idea of what happens when an organ or tissue has been transplanted from one individual to another. The transplant has a complex of antigens incompatible with the tissues of the recipient. Its antigens provoke a mobilisation of the recipient's immunological protection system. First, the transplant is attacked by leucocytes, which are subsequently joined by lymphocytes and plasmatic cells whose numbers grow rapidly. An estimated five to six days after the operation the transplant is packed with all these formations, plus myriads of protective cells setting up an insuperable defence line around it.

Packed with protective cells of the recipient, the transplant dies. But what happens to its mass? Well, the phagocytes act as "scavengers" and slowly get rid of it. Thus we observe an extremely neat and complex pattern of cooperation among many different forces: some of them kill the transplant, others remove the "dead body", still others participate in closing the resultant defect with connective tissue.

The immunological reaction in itself is a very valuable thing as it protects the human organism from any foreign bodies of albuminous origin, including pathogenic micro-organisms and causal agents of infection.

Unfortunately, nature is blind and the human body mobilises its defences and generates antibodies equally hostile to pathogenic microbes and beneficial tissue and organ transplants.

But there is one exception to this otherwise universal rule. There are people whose antigen and tissue structures are absolutely identical. I refer to identical twins who have developed from a uniovular cell. There is no antagonism between their tissues and for this reason identical twins are ideal material for transplant operations. To date some 50 kidney transplant operations have been performed in different countries from one identical twin to another. Some of them have been living with only one (transplanted) kidney for over 10 years now. Unfortunately, it is not only identical twins who sometimes need organ and tissue transplants. Even so, tissue and organ swaps between identical twins have helped medical scientists explore new avenues in the battle against tissue incompatibility.

Now, have medical scientists found ways round the tissue barrier?

Milan Hasek of Czechoslovakia and Sir Peter Medawar of Britain were the first to "fool" the immunological system in a rather ingenious way. They injected an animal embryo with cells of bone marrow, spleen and formative elements of blood taken from another individual (donor). Subsequently when the recipient had grown into an adult they gave him a skin flap from the same donor. The experiment was successful and the skin flap grew on. It was found that the organism's ability to attack foreign antigens is formed towards the close of its embryonic period. During the embryonic period and in the immediate post-natal days the organism is still capable of accepting foreign tissue proteins and fix them in its "memory". Subsequently, the adult organism can accept tissue transplanted from the donor. This phenomenon has come to be known as tolerance.

Doctor Hasek's pupil Puza, who at one time collaborated with our laboratory, proposed creating a similar tolerance to the donor's cells by a total blood replacement in a newborn puppy. The exchange blood transfusions were carried out in such a way as to ensure that the recipients' own blood was always completely evacuated. Incidentally, this method has now been widely adopted in obstetrics. Newborn babies with symptoms of the formidable disease of haemolytic jaundice are now given an exchange blood transfusion immediately upon birth. It would seem that this example does not bear directly on organ transplantation. But consider this, if it is possible to replace all of the recipient's blood,

it is reasonable to expect that a donor's organ can function for a long time with the donor's own blood in the organism of the recipient, provided they both have a similar blood composition.

However, experiments staged at our laboratory were disappointing: even after a total replacement of blood the recipient's organism developed antibodies in response to the addition of a foreign organ and the transplant was quickly destroyed.

What is more, total blood replacement cannot be used parallel with transplantation of an organ from one individual to another because of the extremely grave complications that ensue. Another difficulty here is that tolerance is created to a single donor alone. How can an individual expect to be tied for life to a sole preordained donor-saviour.

For these reasons another method proved more promising one, involving the introduction into an adult recipient's organism of immunodepressive agents. A variety of chemical, physical and biological substances are employed in immunodepressive therapy which is directed primarily at suppressing the function of the recipient's lymphatic tissue. The chemical compounds used for the purpose include imuran, azaserin, tioguanin, hormonal preparations, such as cortison and corticosteron, and antibiotics of the actinomycin C and D type. The use of these substances has prolonged the acceptance of transplants, notably, renal transplants. By 1968 the percentage of functioning transplanted kidneys supplied by human donors not genetically related to the recipients had risen to over 50. Unfortunately, most of the preparations mentioned above are toxic and impair the function of the donors' other organs and tissues. What is more, they weaken the organism's resistance to pathogenic microbes and viruses. Patients injected with these preparations have to be kept in sterile microbe-free environments to preserve them from bacterial contamination.

Intensive efforts are being made to find chemical preparations that would be less toxic and more effective in suppressing man's immunity forces. X-ray and gamma-ray irradiation is also used to reduce the immunological system's action.

Recently methods of radioactive irradiation of lymphatic cells taken out of the organism through special tubes joined to blood or lymphatic vessels have been developed. This "extracorporeal" irradiation of the most active lymphocytes circulating in the bloodstream and lymph makes it possible to suppress them without any toxic effect on the body.

Biological methods of "beating" tissue incompatibility have also

been evolved. One is the so-called enhancement phenomenon which was first observed early in this century during experiments on tumoral transplants of rat sarcomas. Later it was repeatedly reproduced on a variety of tumours in different classes of mammals. The main point about enhancement is that a tumour is accepted and grows vigorously provided the recipient has been parenterally administered, prior to transplantation, a hyper-antiserum containing antibodies hostile to the transplant. Some researchers have graphically demonstrated that the transplant's vigorous growth is due to the action of humoral antibodies. The enhancement phenomenon was also reproduced in transplantations of normal homologous skin flaps. Concerning the mechanism of the enhancement phenomenon, one may assume that a surplus of antibodies has the same effect as a surplus of antigens, which blocks the specific centres of cellular proliferation, causing their death, and nullifies the inductive and productive phases of the immunogenesis, thereby creating tolerance.

Another immunodepressive preparation of biological origin is fast coming into general use. This is anti-lymphocytic serum which is obtained from animals (horses or rabbits) repeatedly pre-injected with human lymphocytes. This serum contains ready-made antibodies hostile to the war-like lymphocytes standing guard over the inviolability of their native organism. A patient with a renal or dermal transplant, when injected with anti-lymphocytic serum, may have a considerably longer use of the transplant.

Thomas Starzl from the United States, who has had the most experience in the clinical application of anti-lymphocytic serum, thinks that it produces better results than other agents and promises good prospects for organ transplantation. The mechanism of the serum action is still not quite clear and is being studied. Often anti-lymphocytic serum is used in renal transplants in combination with immunodepressive chemodrugs. There have been attempts to suppress immunological response by removing some of the elements of the lymphoid system such as the spleen, the thymus gland and lymph nodes. There have been many suggestions but so far no universally recognised method of suppressing natural immunity has yet been evolved. The search goes on.

### **A Borrowed Kidney**

Today many people in different parts of the world are successfully using kidney transplants. One patient lived with somebody else's kidney for over nine years. He was operated upon

in Paris in 1959 by surgeons from the famed Hamburger team. The kidneys are man's chief organ for filtering and secretion. They remove all slags and waste matter from the organism, nitrogenous compounds, products of protein breakdown, salts, etc. It has been estimated that the kidneys filter an average of 140 litres of blood a day. They regulate the water metabolism, osmotic pressure, ionic composition and acid-base equilibrium of the blood plasma. Once the renal function is disturbed, grave disorders ensue which can often prove fatal.

In 1934 Y. Y. Voronoi, a Soviet specialist, first performed the world's kidney transplantation. He took a kidney from the body of a dead man and transplanted it to a female patient dying from mercury poisoning. From a technical point of view the operation was a success, but the kidney transplant later proved functionally deficient and the patient died 48 hours later.

The next attempt at kidney transplantation was made by Doctor M. Servelle of Strassburg. Servelle, likewise, transplanted a cadaveric kidney to a female patient. In the beginning all went without a hitch, but several months later the kidney transplant stopped secreting urine and was eventually rejected.

In 1954 Dr. Murray of the USA scored an impressive success with a kidney transplant. The success was largely due to the recipient and donor being identical twins. Their tissue structure was identical and there was no immunological conflict. Subsequent studies revealed the normal function of the transplant. Later Dr. Murray performed 25 renal transplantations between identical twins. None of the operations was attended by any serious complications.

Intensive experimental work concerned with the study of various methods of suppressing tissue incompatibility furthered successful renal transplantations. One method that was soon put into general use was X-ray irradiation of the recipient. The patient wanting a transplant was subjected to X-ray irradiation in high, often dangerous, doses. In 1959, after Robert Schwartz's discovery of the immunodepressive effect of 6-mercaptopurine, chemotherapy began to oust the irradiation techniques and accounted for successful experimental and clinical homotransplantations.

Immunodepressive drugs became the subject of intensive research in many countries. Our laboratory, too, investigated the effect of 6-mercaptopurine in renal transplants in dogs and dermal transplants in rabbits. This drug, by upsetting the synthesis of albuminous compounds occurring in the nuclei of rapidly dividing cells, suppresses the ability of lymphocytes to attack foreign tissue.

Thanks to 6-mercaptopurine injections, kidney transplants in dogs maintained their function for up to 20 days compared with only 7 to 10 days in dogs that were given no 6-mercaptopurine injections. However, the laboratory animals given this immunodepressant lost appetite, weight and exhibited icteric mucous membranes and skin. This was clear evidence of the drug's toxicity. The drug had a toxic effect on the dogs' blood, and as a result, their haemoglobin count dropped as did the number of formative elements of blood. This was followed by other grave complications such as abscesses and pneumonia. With its ability to combat foreign tissue destroyed, the canine organism was left helpless in the face of pathogenic microbes.

Pharmacologists began looking for a less toxic preparation. In late 1963 a suitable drug was synthesised. Called asatioprine, it lengthened the life of dogs by one to three months. It was administered to the animals three to seven days prior to transplantation, while following the operation the dosage was gradually reduced. Favourable results were obtained with combined injections of asatioprine and prednisolone, a hormonal preparation obtained from the adrenal cortex.

However, as time went by we discovered that asatioprine was also mildly toxic. Besides, like 6-mercaptopurine it lowered resistance to infection. Most of the dogs died from side-effects even though the renal transplant continued to function successfully.

I remember how in early 1965 we decided to demonstrate to a meeting of the Moscow Surgical Society one of the dogs three months after transplantation. This was the first case of a long-term acceptance of a kidney in the Soviet Union. We wanted to introduce the surgeons to asatioprine in order to accelerate its general use. Unfortunately, three days before the proposed demonstration the dog died from an accidental complication which had nothing to do with the kidney transplant.

The search for less toxic preparations to overcome the tissue barrier went on. At last, an agent satisfactory in this respect was found, but it was a biological preparation, not a chemical one. This was anti-lymphocytic serum. Tests revealed, however, that the serum given to a dog 3 to 14 days prior to a kidney transplantation and daily following it, on its own retarded rejection but moderately. Using serum labelled with fluorescein, we studied its interaction with a variety of lymphocytes in the organism and discovered the reason for the insufficient effect. It was established that the antilymphocytic serum had a selective action on different types of lymphatic cells. It enveloped and killed not all of the lymphocytes

but mainly those that circulated in the bloodstream, while the cells of the lymphatic nodes and bone marrow continued to multiply vigorously and fight off the transplant.

Injections of anti-lymphocytic serum coupled with halved and therefore less toxic doses of asatioprine and prednisolone, which affected lymphatic nodes, considerably improved the results. The kidney functioned in most dogs for up to 45 days while in some cases the transplanted kidney functioned for a full 9 months.

In this way we were able to establish the main thing: the animals were capable of enduring a prolonged administration of a rejection-inhibiting drug. One other thing that became clear was that a successful transplantation depended largely on the choice of donor. Apart from antigen compatibility of erythrocyte groups, antigen compatibility of white blood corpuscles is of crucial importance. Dr. Dausset has identified 14 different antigens in human leucocytes, which must be taken into account in transplantations.

The choice of a suitable donor, one who is the least different from the recipient, is made easier by a special lymphocytic skin test suggested by Brent and Medawar. A prospective donor is injected intradermally with lymphocytes of the recipient. This is followed by a vigorous reaction—the recipient's skin reddens and an edema develops. The more violent the reaction the greater the degree of incompatibility.

Transplantation of small skin flaps from several prospective donors to a person, pre-injected with lymphocytes of the prospective recipient, is used for the same purpose. The transplant from the donor with the least tissue affinity is rejected more quickly.

There is another method involving the simultaneous cultivation of lymphocytes taken from recipient and donor in artificial nutrient media in the presence of a special stimulant such as phytohaemagglutinin. The lymphocytes are converted into large cells with active immunity. The greater the number of these cells the less compatible is the pair under study.

By using new methods of immunodepressive therapy and carefully choosing a donor that would be close to the recipient in terms of antigens, clinicians have been able to achieve impressive success in transplanting kidneys taken from the recipient's blood relations and even from strangers.

In 1965 Professor B. V. Petrovsky, member of the USSR Academy of Sciences, performed the Soviet Union's first successful kidney transplantation from a living donor. This operation was



Academician B. V. Petrovsky was the first in the Soviet Union to make a successful kidney transplant

followed by several dozen of similar ones, all of them performed at the Institute of Experimental and Clinical Surgery which Professor Petrovsky heads. There are many people wanting a replacement of diseased organs. The question arises: where the material for transplants is to come from?

The use of cadaveric organs is restricted by the high perishability of kidneys, liver and heart from oxygen deficiency. These organs die even with a relatively short interruption in the blood supply. Medical scientists are working on methods to keep the interruption as

short as possible and improve transplant preservation to allow for the time necessary for patients' preparation for the operation.

As transplant preservation techniques improve cadaveric organ transplants are becoming more common. Out of a total of 1,167 kidney transplantations performed in 1967 over 40 per cent kidney transplants had been taken from dead people. In 1968 the percentage of kidneys supplied by cadaveric donors rose to 56 reading 62 in 1969.

A number of nephrological centres, notably the urological clinic of the Second Moscow Medical Institute, are going over to the exclusive use of cadaveric kidneys. The clinic has gained a wealth of experience in transplanting cadaveric kidneys to the critically ill who were previously considered doomed. These operations are performed by Professor N. A. Lopatkin, Corresponding Member of the USSR Academy of Medical Sciences. He has 36 kidney transplantation operations to his credit. To date, a total of 300 cadaveric kidney transplantations have been performed in the USSR.

The transplantation of kidneys along with the pancreas and duodenum taken from a dead body has also been reasonably successful. Such operations have been performed in the United States for two patients suffering from diabetic nephropathy, a disease affecting the pancreas and kidneys.



But how about transplanting organs from animals to human patients, in particular from higher animals which are close to man in genetic terms? At this point we cannot answer the question with any certainty. Attempts have been made in the United States to transplant kidney from primates to human patients. So far all of them died.

There are no beaten tracks in scientific exploration. Karl Marx was a thousand times right when he wrote, "There is no royal road



Transplanting a kidney to a rat by the microvascular technique

to science, and only those who do not dread the fatiguing climb of its steep paths have a chance of gaining its luminous summits." Organ transplantation is currently one of the stony paths of natural science. The sparkling summits of organ transplantation will be attained only when immunologists, geneticists, physiologists, biologists, engineers and representatives of other branches of science join forces with surgeons to research their tempting but elusive goal.

Organ transplantation is here to stay. New opportunities and resources are sure to be found. Apart from animal and human, including cadaveric, donors, there are bound to be ingenious prostheses, and sophisticated devices, capable of simulating biological systems. When these are available doctors will be in a position to save thousands upon thousands from premature death.

### **When the Heart Stops**

On December 3, 1967, the world was given sensational news: the first successful heart transplantation had been performed on a human patient. Louis Washkansky of Cape Town had become the first ever recipient of a heart taken from another human being. She was Denis Darvalle, a young woman killed in a car accident. The pioneering operation was performed by Professor Christian Barnard. Everywhere people closely followed the outcome of that audacious operation. Newspapers and medical bulletins gave front page reports of Washkansky's condition. For eighteen days and nights the personnel of Groote Schuur Hospital in Cape Town kept the transplanted heart beating. Everybody wanted to believe that a miracle would occur. But Washkansky died. This did not come as a surprise, though the fact was that apart from an advanced heart disease Washkansky also suffered from diabetes mellitus, a disease that always complicates any operative intervention.

Washkansky had survived the operation well. But the surgeons were confronted with the challenging task of preventing rejection. The patient was given large doses of immunodepressive drugs and was irradiated with cobalt. In the process, his resistive capacity to infection, already weakened, dropped disastrously. Against the background of pronounced pathological changes in his bone marrow, exacerbated by diabetes, a double pneumonia developed. To make things worse there were sinister signs of rejection in the shape of cellular infiltration around the blood vessels and necrosis of the myocardium. So Washkansky's death was not caused by any mistakes or lack of skill on the part of the surgeon. On January 2,

1968, Barnard performed a second successful heart transplantation on Filipp Blaiberg. This time the operation was a success. Blaiberg lived nearly two years with a transplanted heart.

The Frenchman, Abbot Bulon, had the heart donated by a 39-year-old man for 17 months. That operation was performed by the well-known French surgeon Charles Dubost.

Robert Macky, a 52-year-old American, who was given the heart of another man by Professor Shumway of Palo-Alto, California, in the summer of 1968, broke both Blaiberg's and Bulon's records.

Are we to conclude then, on the basis of these successes that heart transplantation operations have come to stay? To answer that question we must turn to the facts and analyse them carefully.

Since that pioneering operation performed by Christian Barnard, many similar operations have been performed in different countries including the USA (Shumway, Kantrowitz, and De Bakey), France (Dubost), USSR (Vishnevsky and Solovyov) and Czechoslovakia (K. Šiška).

By late 1970 a total of 165 heart transplantation operations had been performed in various countries. Twenty-six recipients survived for more than a year and 9 for over two years. Two-thirds of the recipients died within the first three months. The American surgeon Shumway has the most impressive record of all: out of the 25 patients he operated upon, 30 per cent survived six months and another 34 per cent survived over 18 months.

The most frequent cause of the recipient's death was rejection. Then follow infection and sepsis which develop as a sequel to the administration of immunodepressants. Many recipients died from heart deficiency in the immediate post-operative days.



V. P. Demikhov was the first to achieve a stable accretion of a dog's head transplanted onto another dog's neck

In 1972 in different countries, some 40 people were living with other people's hearts. One of them, Emmanuel Vitria, a 50-year-old French commercial traveller, and father of three children, celebrated the third anniversary of his second birth on November 27, 1971, while another, Louis Russel of Indianapolis, USA, has beaten this record with the heart of a 17-year-old youth.

So Christian Barnard's bold experiment stimulated other attempts by other surgeons. It should be pointed out that Barnard's pioneering operation in 1967 had been preceded by several years of intensive and painstaking research and experimental operations on laboratory animals. He had made a careful scrutiny of the experience gained by other experimenters. In 1960 he visited the Soviet Union where he familiarised himself with operative techniques developed by V. P. Demikhov, Doctor of Biology.

The first attempts at heart transplantation were made long before Christian Barnard. The earliest were made in the opening years of this century by Guthrie and Carrel. They began by sewing a puppy's heart to the blood vessels on the neck of another puppy. The transplanted heart functioned for several hours until its cavities became cluttered up with clots. Professor F. Mann scored a more impressive success in the 1930s. His heart transplant functioned for 8 days. In 1951 Marcus, followed by Downie in 1953, and Bing in 1962, reproduced heart transplantation operations using Mann's technique. These experiments revealed that it was possible to restore the cardiac function in the heart taken from an individual and maintain it for a sustained period.

However, the early experimenters pursued purely physiological goals. They were primarily interested in watching the heart function in isolation without any neural links with the native organism. They did not attempt heart transplantation in the modern sense of the term.

For many years Sinitsin and Demikhov in the USSR conducted interesting experiments on lab animals. Demikhov spent several years working in the operative surgery department of the First Moscow Medical Institute. He was the first to transplant a dog's heart not onto the neck of another dog but inside its thoracic cavity beside the recipient's own heart. That was a far more complex operation calling for refined surgical techniques. To find the simplest and most efficient operative philosophy Demikhov had tried over 20 alternative procedures. The first attempts ended in failure, with all the dogs dying on the operating table.

But Demikhov did not let his failures put him off. As he perfected the operative techniques and improved the method, the death of dogs during operations became increasingly rare. Now the dogs died within several hours of the operation because of irreversible changes in the heart transplant and numerous clots forming at vasosutures. Then the experimenters decided to use a vascular suturing device designed by F. Gudov. The number of deaths from thrombosis was cut sharply. The dogs began to survive for up to 9 days. However, later they were killed either by myocardial infarction or clots in their blood vessels. There was, however, one encouraging and memorable exception, a dog called Grishka, which in June 1962 was given a second heart and survived for 141 days.

Perhaps, the most remarkable thing about Demikhov's experiments was that the heart transplant continued to function in the thoracic cavity of a warm-blooded animal. After being sewn up to its major cardiac and pulmonary vessels the transplant later participated in its overall circulatory system. Thus the dog was given an additional blood circulation organ, which acted as a second "pump" making the work of the dog's own heart much easier.

Demikhov also carried out other experiments which involved transplanting heart and lungs to another dog. First, the heart along with both lungs was sewn inside the thoracic cavity of another dog. For ten minutes the dog had two sets of heart and lungs. Later, the dog's own heart and lungs were removed by stages in order not to disturb the blood circulation in the dog's brain.

It has emerged that the problem of tissue incompatibility in heart transplantation proves to be even more complex than in kidney transplants. The greater the tissue incompatibility between donor and recipient, the earlier the symptoms of heart rejection appear and the sooner the recipient dies.

Inspired by Demikhov's success, surgeons, both in the USSR and abroad, went a stage further. In 1958 Dr. Goldberg and his team published the results of three attempts at heart transplantation. However, his transplants only functioned for brief periods ranging from 20 minutes to two hours. Dr. Webb, who used the same technique, succeeded in prolonging the life of his transplant to seven and a half hours.

In 1960 Norman Shumway came up with a new technique that had been perfected on laboratory dogs. The main point of his technique was that not the whole heart was removed, but the bulk of it, including the ventricles and the lower part of the atrium. The

upper part of the abrium, along with the larger veins was left in place. The surgeon cut out a heart transplant of the same size and shape from the donor's heart and transferred it to replace the cardiac tissue removed from the recipient's heart. With the use of drugs suppressing tissue incompatibility, as much as 80 to 90 per cent of the dogs Shumway operated on survived for over a year.

Shumway's technique was simpler and more rational, reducing as it did the duration of the operation, the number of vascular sutures and the duration of ischemia.

Other experiments were performed to explore alternative techniques. On January 22, 1964, a 68-year-old man was admitted to a clinic in Mississippi. The patient suffered from a severe heart deficiency and was unconscious. Towards evening his arterial pressure began to fall catastrophically and this was followed by atrial fibrillation. All measures to restore normal heart rhythm and breathing proved to no avail. On January 23 his condition deteriorated further and cardiac arrest was ominously imminent.

Coincidentally there was another patient at the clinic, a young man, who was dying from a brain tumour. There was no hope for him, and his relatives allowed the surgeons to use his heart to save the 68-year-old heart sufferer. But at the last minute the surgeons could not summon courage enough to take the young patient's heart while he was still alive.

Yet something had to be done about the older patient. No sooner was he placed on the operating table than his heart stopped. The man was switched onto extracorporeal circulation. In the face of these ominous symptoms, the surgeons decided to try a bold experiment. They transplanted a pre-prepared chimpanzee heart to the dying patient. After being warmed and defibrillated the heart settled down to a rhythmic 90 beats a minute. Before long, however, it became clear that the small chimpanzee heart was unable to provide an adequate blood supply for the human patient. The ventricles and auricles were being overflowed, and James Hardie, the surgeon in charge, had to push the blood collecting in the cavities by massaging the heart. The patient survived for only two hours.

For all its bizarre quality, Hardie's experiment should not be underestimated since each step bringing us closer to the goal is invaluable.

Now what conclusion can one draw from the foregoing? Despite a series of successful operations that set the world agog with excitement heart transplantation is still a largely unresolved

problem. It is still at the experimental stage, however encouraging and daring the experiments may be. One should not be misled by the spectacular operations performed by Barnard, Shumway, Dubost and others. They are still little more than experiments.

Some may object, saying that any operation, let alone a pioneering operation, is a leap into the unknown and in this sense is in the nature of an experiment. I could not agree more. What is equally beyond doubt, however, is that a new method of treatment is only approved for general use following prolonged and thorough trials on experimental animals, when all potential dangers and uncertainties have been eliminated. Surely, this is more than we can say for heart transplantation operations.

Some may object of course that time does not wait. The clinic often has to apply what the laboratory has just come up with. In fact sometimes clinical application precedes the experiment. We know many examples of this from medical history. Thus, Louis Pasteur had barely tested his vaccine on animals when he was called upon to use it to treat a human patient, 9-year-old Joseph Meister, who had been bitten by a rabid dog. The boy survived and Pasteur achieved an important victory. The vaccination technique he pioneered won universal recognition. That, however, came much later, but on that first occasion as he was injecting his vaccine with an unsteady hand Pasteur was not sure what the result would be. It was a clear case of an experiment on a human patient. No one today would think of depriving Hardie, Barnard and other mature and responsible medical scientists of the right to experiment.

In surgery, just as in other branches of medicine, one may accept as the guiding principle the motto of *primum non nocere*, above all do no harm. This motto reflects the limited possibilities of medicine at any given point in time. Or he may take calculated risks in the name of humanity and humaneness. Personally, I plump for the latter. I think that Professor N. M. Amosov is right when he urges his colleagues to be as bold as possible in their search for ways of helping the doomed. The well-worn path of operating on human patients only when new operative techniques have been thoroughly tested on laboratory animals may not always be the best approach and it is certainly not a short cut to success. Indeed, almost all the dogs which underwent heart transplantation operations died soon, whilst many of the human patients survived, for a fairly long time. No one has any right to reproach the surgeon for a failure during a high-risk operation. Had Pasteur failed to summon enough courage on that occasion, the boy would have

died. So a crime against humanity in this case would have been a decision to play safe and not take a calculated risk.

What I mean is that the words "experiment on a human patient" should not be allowed to scare surgeons off. We should call things by their proper names: an experiment is a legitimate part of the scientist's search for new knowledge. But the inevitable dangers and risks that accompany that search can only be justified by the specific circumstances surrounding it. An operation is always a last resort measure taken when all the other possibilities of helping the patient have been exhausted.

Some years ago Professor Juro Vada of Sapporo, Japan, performed a very complex heart transplantation operation. The recipient, 18-year-old Miyadzaki, survived for some three months. Two years later, however, a medical association in Japan instituted proceedings against Professor Vada accusing him of murdering the two patients involved. A heated controversy developed in the press around two questions: a) was the recipient in a sufficiently bad state to justify a heart transplantation operation, and b) was the donor, indeed, a 100 per cent dead when his heart was taken away from him.

After a long enquiry Professor Vada was exonerated for "lack of evidence". Still, the Vada case failed to dispel the lingering doubts about the advisability of that particular operation.

In my view, there is an extremely important point to be made about organ transplantation. It is that, as distinct from other types of surgery, a transplantation operation involves two individuals, donor and recipient. The former is a quite healthy human being willing to donate one of his or her paired organs, for example a kidney, to save the life of the latter. If the transplantation operation is a success both live. The situation is completely different when the heart is the object of a transplantation operation. In this case the surgeon finds himself on the horns of a dilemma: which of the two is to be saved? The prospective donor, a human being on the brink of death, or the recipient whose life is hanging on thread. I believe that there is only one answer to the dilemma, and that is that the doctor's task is to try and save both.

Imagine that two patients are admitted to an operating theatre. One of them is dying of a heart disease. The other of a fatal brain injury. The latter's heart is still good. He is dying but is not dead yet. In a situation like this neither the surgeon's consummate professional skill, nor his experience, nor his unassailable integrity makes the decision any easier. Not so long ago an eminent Soviet surgeon relapsed into clinical death as many as 57 times and each



time was brought back to life. What if someone had taken a snap decision to use his heart for transplantation purposes?

So this is the basic moral and ethical aspect of the problem, and we are constantly reminded of its incredible complexity by hospital experience.

On May 3, 1968, Professor Ross of the National Hospital in London performed a successful heart transplantation operation on Frederick West, who suffered from a severe cardiac deficiency. The donor on that occasion was Partick Ryan, a young joiner, who had sustained a severe brain injury after a fall from a scaffolding. When admitted to the resuscitation ward of King's College, London, Ryan was in a deep coma. His heart had stopped twice and on both occasions he had been brought back to life by manual massage and a defibrillator. His pupils however remained dilated and failed to react to light. His respiration had ceased and electroencephalograph and electrocardiograph detected no biological potentials or cardiac function. The neurosurgeons who tried to save Patrick's life were confronted with irreparable damage to his respiratory and vasomotor centres. The specialists who examined him were unanimous in concluding that any further attempts at resuscitation would be a waste of time. Shortly afterwards another team of specialists including anaesthetists, general surgeons and orthopaedic specialists also returned a verdict of death. Nonetheless, a heart-and-lung machine was used to provide extracorporeal circulation in a bid to gain time. In the meantime Patrick's relatives had given permission for the surgeons to use his heart to save another dying patient. A quick check revealed genetic histocompatibility between donor and recipient for as many as 21 factors, which was only one component less than in the Blaiberg case.

Two teams of surgeons went into action simultaneously using two separate operating rooms. The first team, led by Keith Ross, was to extract the heart from Ryan's thoracic cavity, while the other, headed by Professor Donald Ross, was preparing Frederick West for the operation. In the final phase of the heart transplantation operation the donor's heart was carefully placed in the recipient's pericardium. The donor's auricles were sewn up to those of the recipient, the pulmonary arteries and aortas of both were linked and the wound was stitched up layer by layer. Shortly afterwards it became clear that the operation was a success.

That operation, which was completed in a matter of hours, had been preceded by many years of painstaking research and experimentation. Professor Donald Ross, who had gone to the same

college as Barnard, is one of the world's top surgeons, with some 200 transplantation operations on cardiac valves to his credit.

The news of the successful operation swept Britain overnight. The newspapers and magazines split into two camps with one side considering the operation premature from a medical point of view and untenable morally, while the other side maintained that the operation was justified and pointed to Philipp Blalberg's case.

Undoubtedly, some success has been scored in heart transplantations. We Soviet doctors are glad both for the patients and for our foreign colleagues. But still we have to temper our optimism with realism and look at statistics.

Within a year of Barnard's spectacular operation, which set the world agog with excitement, an estimated 100 heart transplantation operations were performed. In the next two years, when the enthusiasm had somewhat waned, about 100 heart transplantations were performed. Today some of the world's finest specialists, after performing one or two heart transplantations, have abstained from any more attempts. Even Professor Dubost, the eminent French surgeon, with three successful heart transplantations to his credit, including the celebrated heart transplantation for Abbot Bulon, recently confessed that the great number of heart transplantations performed within a relatively brief time was not justified by the scientific state of the problem.

Other eminent surgeons concur in this view. But there are such as think differently. Professor Shumway, the American surgeon, with 25 successful heart transplantations to his credit, says he attaches great importance to these operations and believes that the future of surgery belongs to them.

After the 24th Congress of Surgeons, held in Moscow, Academician Karol Šiška, President of the Slovak Academy of Sciences, replying to the question what area of cardiac surgery he considered to be the most promising, replied without hesitation, heart transplantations of course. He added that despite the formidable obstacle in the shape of the rejection reaction he took a sanguine view of the heart transplantation problem.

To be sure, optimism goes with being a good scientist. But optimism must always be moderated with realism. Let us see where we stand now.

There is no lack of formidable problems to be overcome in this connection, including those of a medical, technical, ethical and social nature. These are engaging the attention of physiologists, immunologists, biologists, biochemists, engineering experts and lawyers, as well as doctors.

To begin with, the heart transplantation technique is still to be worked out fully. Recent achievements in this direction include the techniques for linking blood vessels developed by A. Carrel, Shumway's ingenious methods and the development by Soviet specialists of a reliable vasosuturing apparatus. Still a lot remains to be done here.

A few words now about another aspect of the problem. It is common knowledge that there are far more patients needing a heart transplant than there are donors, victims of road accidents and such like. I believe that the best way out is to use the still viable organs of human cadavers. This would remove all ethical objections.

The time will surely come when the surgeons will have gained an insight into the innermost secrets and subtle mechanisms of the living cardiac tissue and will have found methods of sustaining the organs of dying patients for days and perhaps weeks after the death of the patient. Medical scientists throughout the world are looking for effective ways and means of restoring cardiac function after its arrest.

One other question must claim our attention. It is the problem of cardiac reinnervation. The point is that tissues and organs upon severance from their neural links with the body undergo complex metabolic and structural changes. The disruption of neural links (denervation) entails severe disturbances of the protein, hydrocarbon, electrolyte and hormonal metabolism. Therefore, it is important for surgeons to learn to restore severed neural links quickly. Is it possible to do so? The answer to that is "yes". Research carried out by S. V. Andreyev, B. D. Dedova and T. I. Cherkasova indicates that it is feasible. However, further research has to be done to identify effective techniques for accelerating the reinnervation of the transplanted heart.

The life-span of, say, a transplanted kidney is severely limited in the majority of cases. The reason for this is the tissue barrier, the imperfection of immunodepressive therapy and so-called chronic rejection. But this problem is still largely obscure. We believe that the rapid "perishability" of the renal transplant and the onset of sclerotic phenomena in it are attributable not only to the immune response of the host body but also to denervation. We also believe that the surgical restoration of neural links, if properly done, could prevent these changes, or, at least, reduce them. Further research and observation of experimental animals, we hope, will provide the clues.

Finally, we do not yet have reliable tests to help us determine, with absolute accuracy, the life-span of a transplant under specific conditions. So far, there is no way of determining the "wear and tear" of the donor's heart and of the recipient's own tissues.

The functional capability of a heart transplant can be determined with a sufficiently exact approximation. I do not doubt that engineers, physiologists and cybernetic experts, working together, will before long develop equipment capable of providing pertinent forecasts with mathematical accuracy.

What is far more difficult to forecast is the behaviour of the heart transplant in the host body. Only the lay public was stunned by the article published by Doctor Thompson, a pathologist at Groote Schuur Hospital in Cape Town, in the British journal *Lancet*. Doctor Thompson wrote that in the 19 and a half months, the young and completely healthy heart transplanted to Blaiberg had undergone morbid changes in the host body the like of which he had not seen in any autopsy in his more than 40 years as a pathologist. Alas, despite the impressive achievements of modern medical technology, the surgeon is still unable to allow for the potentialities and resistive capacities of the recipient's basic vital organs and systems: his lung, liver, kidneys, blood vessels, etc. In this case we are not referring to "rejection" but rather to the transplanted heart's "environment" in the host body.

A similar case was reported by Professor A. A. Vishnevsky who performed the first Soviet heart transplantation. The recipient, a young woman, survived for 33 hours. During the operation it was established that apart from a serious heart disease she exhibited no less severe affections in her pulmonary blood vessels. Later pathoanatomic changes were also discovered in other organs.

The ideal situation would be if the heart was worn out and needed to be changed while all the other organs were in perfect condition. Unfortunately, it is only a rosy dream. The point is that a diseased heart inevitably casts a shadow across the whole of the body. So the surgeon can only hope that the resultant "darkness" is not complete and a gust of fresh wind may yet chase the clouds away.

Are there any grounds for optimism? There are. No operation known to modern medicine can have a hundred per cent guarantee of success, not even an operation for appendicitis or hernia. There is, understandably, even less guarantee of success with heart transplantation. Nonetheless, the immune reaction is not insuperable. The problem of biological tissue incompatibility, although it is a formidable one, undoubtedly can be overcome. To

date, medical scientists have identified as many as 30 factors responsible for tissue compatibility. Medical scientists in the USSR and other countries have worked out special classification tables making it possible to determine the degree of tissue affinity. These tables are a great help in matching donors to recipients. But in the operating room surgeons often have to take snap decisions. They cannot afford the luxury of going into lengthy comparisons using classification tables while the sands are rapidly running out for the accident victim whose heart may stop at any minute. Still the outlook is not as bleak as it may seem at first glance. In the first place, something can be done even now, and secondly, the use of sophisticated electronic devices holds great promise. Electronic computers can help the surgeon gain time and win the battle against the blind immune reaction.

The absence of a sufficiently effective method of auxiliary circulation is a factor hindering the solution of the problem and preventing a higher success rate for heart transplantations. The point is that in the initial period the heart transplant finds it particularly difficult to cope with the burden assigned to it by the host body. With a renal transplant the "artificial kidney" machine or dialyser provides a lot of help serving as a sort of "crutch". In the initial period the "artificial kidney" handles part of the renal function, thereby making the transplant's job easier. It is the "artificial kidney" machine that has helped hundreds of renal transplantation patients over the most dangerous period of immune reaction and enabled them to overcome the "rejection" crisis. Medical scientists in the USSR, the USA and other countries are working hard to develop an effective "artificial heart", one capable of "replacing" the natural heart for many hours and even days.

On April 5, 1969, Professor D. Cooley of Hewston, Texas, gave an artificial heart to 47-year-old Haskell Carp. The man-made heart functioned for 63 hours, while the patient was awaiting a heart transplant from a human donor. While he was waiting, his condition had deteriorated alarmingly and, according to Professor Cooley, he would have died, had it not been for the artificial heart. The artificial heart had been designed and built by the Argentinian specialist Doctor Domingo Liotta who works in the United States. The heart is made of dacrone fibres and plastics and is electrically operated. When a suitable donor was finally found, Professor Cooley took the man-made heart out of the recipient's thoracic cavity and replaced it with the heart of a 40-year-old woman who had died of a brain disease. Unfortunately, the heart transplant



Professor V. I. Shumakov switches on an artificial heart in an experiment

stopped beating the next day and the patient died. Despite the tragic finale, that operation was of great importance as it involved the use of a man-made heart until a suitable donor was found.

Professor V. I. Shumakov and his team at the Institute of Experimental and Clinical Surgery, recently achieved an impressive success. They developed a man-made heart and tried it out successfully on laboratory animals. Similar work is being done by medical scientists in other Soviet institutes and laboratories.

Some of our foreign colleagues take a sceptical view of the possibility

of giving a mechanical heart to a living human body. I, too, tend to share their scepticism and do not believe that an artificial heart could support life for any meaningful period of time. Nonetheless, I believe that the effort and resources put into developing a man-made heart are justified, if only because the mechanical heart can be used for a brief period to tide the patient over. For instance, when the patient's heart, crippled by severe myocardial infarction, is having difficulty coping. What if, at a critical point, another "pump" goes into action taking over part of its workload. Who knows perhaps the patient's own heart after taking a rest will be able to overcome the crisis and no heart transplant would be required.

Or take another case: a heart transplant operation is the only

answer when all the orthodox methods of treatment have been tried and have failed. Then the artificial heart will put an end to the race against time that often reigns in the operating room. With the artificial heart surgeons can proceed at a leisurely pace thinking everything out carefully. While the artificial heart holds the fort, the surgeons will be able to pick a suitable donor with a satisfactory tissue compatibility. Heart transplantation operations will then become more reliable and have better results. I also hope that the development of a suitable artificial heart will make the creation of organ banks less of a problem. Whichever way you look at it, the quest for an effective man-made heart is thoroughly justified.

### **Rejuvenation**

In the Europe of the 18th century medicine like other sciences was under the oppressive domination of the Church. Medical research was a dangerous pursuit that could bring a bold spirit no end of troubles and lay him open to the charge of heresy. However, Doctor Gunther of Germany, indaunted and unafraid, began his enquiries into the structure, function and role of endocrinal glands. At one point he decided to try an experiment. He transplanted a rooster's sex gland to a hen. The result was striking. The hen grew



The first independent operation performed by graduate students



a comb crest and its behaviour began to resemble that of a cock.

Later, other medical scientists presumably inspired by Gunther's successful experiment began transplanting animal sex glands to humans in an effort to rejuvenate them. The French physiologist Brown-Sequard achieved some interesting results. He believed that ageing was a consequence of a weakened functioning of the endocrinal glands which produce vital hormones. What he did was to prepare an extract from animal seminal glands and injected it into his own body. Initially, it seemed that the desired effect was achieved. His tone improved markedly and his mental capacity and potency improved. Unfortunately the effect proved short-lived and subsequent injections provoked a deterioration in his general condition. Despite this failure, medical scientists in other countries continued to experiment in this area.

S. A. Voronov, a Russian doctor, who worked in France in the 20s of this century, conducted some interesting experiments. He transplanted seminal glands taken from bulls, rams and primates to humans. He failed, however, to achieve a long-term acceptance. Voronov and his numerous disciples grafted seminal glands both wholly and by individual lamina, in other words following much the same technique as that employed by Brown-Sequard. However, the effect was of limited duration.

Voronov's followers tirelessly searched for the cause of the grafted seminal glands' rapid resorption. They tried various regions of the human body to see if the site affected the resorption period. They grafted testicles onto abdominal muscles, into the abdominal cavity, on the thigh muscles and under the skin of the mammary glands. It was found that the grafted testicle took a longer time to resorb when placed in the scrotum.

However, the short-lived effect of transplanted seminal glands disappointed the researchers. In the end many medical scientists lost all interest in the transplantation of endocrinal glands.

World War II caused many surgeons to take another look at this largely forgotten problem. During the war many of those who survived severe injuries in the region of the sex organs later developed castration phenomena, which led to a deterioration in their general state of health and to frustration resulting from sexual impotence.

In the immediate post-war years new operative techniques for transplanting testicles were evolved in the USSR. They involved transplantation not of just testicles but testicles along with the neighbouring blood vessels which were linked to the blood vessels



of the host body. This ensured a normal blood supply to the graft and lengthened its life.

Still, eventually the implanted seminal glands were resorbed. One reason for this was that the surgeons who had performed the operations had regarded testicles as a specific independent hormonal tissue and had failed to allow for the fact that, as with any other human organ, strict observance of the rules of transplantation was imperative.

When transplanting a cadaver's testicle it is important to match the donor's blood group with the recipient's. It is also important to establish the degree of tissue compatibility between the cadaver donor and the living recipient. Finally, the testicle should be transplanted quickly, while it is still viable.

The testicle should be stored, pending the operation, at the right temperature in a sterile nutrient solution. Safe storage time is severely limited.

The success of a transplantation operation involving seminal glands and testicles also depends on the correct choice of operative procedure. Further, even when we have succeeded in preserving a testicle in a viable state for a sufficiently long period we have no way of determining, prior to the operation, the degree of its viability. There is one other important aspect to be borne in mind. We should always remember that by transplanting a testicle to the host body we introduce into it a quantity of foreign proteins thereby provoking an immune reaction. The main task is to prevent or at least weaken the immune response and reconcile the host body with the foreign organ. To ensure a long-term acceptance of the grafted testicle one subjects both the recipient's body and the transplant to a special treatment.

Some encouraging experimental and clinical findings have been reported in this area. Patients who have undergone transplant operations have been known to exhibit a positive functional effect for as long as six years. There are grounds for hoping that the day is not too far distant when surgeons will be able to restore to people their lost virility.

These and other problems have been the subject of intensive research at the organ and tissue transplantation laboratory at the First Moscow Medical Institute. It looks as if the 20th century which has been variously dubbed the century of space exploration, the century of the atom and cybernetics, will also go down in the annals of human history as the century of transplantation.

## Looking into the Future

Long-term forecasting as the scientific basis of planning promotes greater effectiveness in scientific research making for a more sensible deployment of available resources, technical facilities and research personnel. The main point of medical and public health forecasting is to identify the more promising avenues of research, to set reasonable time limits for resolving major problems, establish the expenditure of materials and labour involved, and explore the possibilities of the practical application of the findings of research.

The decision of the Central Committee of the CPSU and the USSR Council of Ministers on further measures to improve public health services and advance medical science in the USSR speaks, among other things, of the need to work out long-term forecasts for progress in the principal areas of medical research (from 15 to 20 years hence) alongside with viral diseases, malignant tumours, cardiovascular diseases, nutrition for the healthy and the sick, the decision mentions the genetics of hereditary diseases and organ and tissue transplantation.

Now, what is the outlook for organ transplantation? Some of its future contours can be discerned even now. The discoveries already made, the hypotheses proposed and clinical techniques elaborated form the basis for a gradual introduction of organ transplantation into general practice. In other words, organ transplantation from a purely academic discipline is gradually becoming part of the purely fabric of the public health services.

Although forecasting for organ transplantation is still a difficult business because of the many, often conflicting, opinions, one thing is certain—it is a department of medicine developing at the junction of general immunology, medical genetics, virology, oncology, and it is bound to provide a basis for a successful solution of many different theoretical and practical problems relating to general biology. For instance, a number of oncological problems are closely related to those of transplantation. We are completely in agreement with Bernard Amos when he says that parallel studies of metabolic processes in transplanted and cancerous tissues may go a long way towards explaining the nature of transplantational and tumorous antigens. In fact, when we discover the hereditary causes of malignant tumours, the genetic principles of tissue incompatibility will come to light. Further, it is quite possible that the findings obtained by scientists studying the immune response may well help in unravelling the mystery of malignant neoplasms.

On the basis of existing hypotheses and the evidence of current research it can safely be predicted that transplantology will have a telling impact on research into autoimmune processes. Thus, Dr. Robert White believes that even if brain transplantation fails to become a standard organ substitution technique in the near future, it will nevertheless provide a good biological model for investigations into nervous disorders such as multiple sclerosis, in which autoimmune reaction is assumed to be one of the etiological factors.

Further, advances in transplantation will shed light on the cause of a haemolytic jaundice in the new-born, and choriocarcinomas—pathological states springing from the incompatibility of certain factors between foetus and mother.

The comprehensiveness and multidirectional thrust of research will be the main feature of future research in organ transplantation. Even now it is hardly possible to hope for success in any aspect of medical science without pooling the teaming up of research workers in different fields. In his work, the medical scientist not only draws on his own findings but also on those obtained by his predecessors and his counterparts working in other areas of medical research.

In the future, I expect the pooling of resources of different researchers in transplantology to culminate in a global organisation of which the present European Transplantation Service is the prototype. This organisation, based on the cooperation of transplantologists and experts in allied fields, is designed to organise centralised matching of donors and recipients. The experience already gained by this organisation points to the shape of the transplantation services likely to be with us next century. Computers will store information on every man and woman living, special reference to potential recipient and donor characteristics. The information will cover blood group, Rh factor, immunological passport (characteristics of leucocytic and tissue antigens), age, nervous system type, character traits and a history of diseases. The donor data will include the indices of all men and women living with the same phenotype as the particular individual or differing from him for no more than one or two antigens. Such a transplantation service, backed up by efficient television facilities will ensure a quick and accurate matching of donor and recipient on a global scale. Needless to say, the transplantation service of the future will have an adequate organ bank at its command.

Even today the transplantation of vital human organs has become a reality thanks to the advances in operative surgery and

the emergence of a new doctrine on specific immunological mechanisms that has come to be known as transplantational immunology. As of March 1, 1973, according to the statistics provided by the International Registration Centre, a total of 205 heart transplantations had been performed for 202 recipients (a total of 61 heart transplantation centres had been registered). By that date 30 recipients of heart transplants were alive. Six heart transplant recipients have been leading full lives for over four years. Another five have survived the operation for nearly three years now. Liver transplants had been performed for 179 patients (a total of 39 liver transplantation centres had been set up). Fifteen liver transplant recipients were still alive. One liver transplant recipient had survived the operation for a full four years. Lung transplantation operations were performed on 32 occasions (20 lung transplantation centres had been registered). The longest a lung transplant recipient survived the operation was 10 months. Kidney transplantation operations had been performed for a total of 11, 589 recipients on 12,669 occasions (239 kidney transplantation centres had been registered). As of March 1, 1973, some 5,000 kidney recipients were still alive. One recipient has lived for over 16.5 years.

The foregoing suggests that in the next 15 or 20 years organ transplantations will become a standard clinic procedure even though it is at present hampered by the still imperfect methods of suppressing tissue incompatibility. In the next 5 years experiments and clinicians will concentrate their efforts on the transplantation of kidneys, heart, liver, lung, pancreas and endocrinal glands.

Regeneration and making artificial organs, two other areas of reconstructive and restorative surgery, will be developing parallel to organ transplantation. The idea of making artificial organs seems very promising and is much publicised nowadays. The participation of physicists, mathematicians, electronics experts, and biophysicists in resolving transplantation problems coupled with the latest advances in cybernetics and bionics give one hope that artificial liver and pancreas may be developed within the next 10 to 20 years. Even now, the artificial kidney and heart machines capable of taking over for a time from their living counterparts are used extensively.

Needless to say, simultaneous efforts will be made to tackle problems relating to the development of more effective, specialist drugs (both chemical and biological) capable of suppressing the rejection reaction. At the moment induction of specific tolerance

and enhancement hold out the best promise. The two mechanisms are closely related and, some experts believe, the study of one will help unlock the secret of the other. The antilymphocytic serum is attracting close attention. According to Balner, the serum holds out great promise. Its advantages over existing immunodepressive chemodrugs indicate that further research into its clinical application is thoroughly worthwhile. The urgent task now is to isolate the immunodepressive principle of the antilymphocytic serum and then subject it to close scrutiny.

Another urgent task is the study of transplantational antigens. To date, a total of 28 different leucocytic antigens have been identified. They are classified in a table known as the HL-A system. Twenty-two of them have now been incorporated into the international classification while the remaining 6 have been confirmed by several immunological laboratories in different countries. However, so far, all efforts to isolate the transplantational antigen in pure form have failed. Geneticists are still unable to analyse directly the loci (positions of genes in a chromosome), which are responsible for human tissue incompatibility, because of the incredible structural complexity of chromosomes and the absence of suitable techniques. Too little is as yet known about the gene, its localisation, morphological "image" and the structure of the genetic apparatus as a whole, specifically about that part which is responsible for the heredity and synthesis of tissue specificity antigens. To sum up then, there are two main questions still unanswered in genetics: a) the nature and localisation of antigens which are controlled by the loci of tissue compatibility and b) their structure. Progress in these fields will speed the day when the immunic reaction will cease to be the formidable barrier it is now.

If current trends are any guide, it is not too much to hope that the day is not far off when transplantologists will be employing mathematical analysis of the genetic aspects of tissue compatibility to forecast the course and outcome of a particular transplantation operation. This will boost the success rate of bone marrow transplantations, a critical procedure in treating severe cases of radiation disease.

Important work is being done on organ preservation and this is fast evolving into a discipline in its own right. A top-priority task here is developing effective ways to preserve the viability of organs destined for transplantation. Promising possibilities here include deep hypothermy, hypothermic oxygenation, the use of inert gases at high pressures, isolated perfusion, and the biological

preservation of organs such as the heart and elements of the cardiopulmonary system. One problem presented by deep hypothermy is prevention of the crystallisation of intercellular water. The answer to this problem lies on the interface of physics and biology. There are, then, some of the various problems presented by transplantation, a new area of medical science which is still taking tentative but encouraging steps.

# A HIGHLY RESPECTED AND RESPONSIBLE OFFICE

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## I. THE TRAINING OF SOVIET DOCTORS

*The pupil is not a vessel to be filled but  
rather a torch to be kindled.*

*An ancient maxim*

### The Teacher and the Pupil

In 1956, I was appointed Rector of the First Moscow Medical Institute, one of the oldest and most prestigious medical schools in the country, where I had been student post-graduate, assistant professor and finally professor holding a chair. My tenure spanned 10 years during which, apart from my administrative duties, I did scientific research, delivered lectures and conducted practical sessions.

The performance of, say, a factory manager is judged on the basis of his factory's success or failure to fulfil its production targets for quantity and quality.

But how does one judge the performance of the rector of a medical institute? His duties are many and varied covering, first of all, the training of skilled doctors, the guidance of the institute's research activity and supervision of the treatment of patients at the institute's clinics. Of course, one can always focus one's attention on the student's academic progress. To be sure, the knowledge in a variety of fields and the skills that the student acquires form the base plate of his professional competence. But these alone are not enough to make him a good physician. Of all the professions known to man the physician is in a class apart. Unless the young medic puts his heart and soul into his work, in addition to his specialist knowledge, he cannot hope to become a really good

specialist. And medicine is one field where no perfunctory attitude can possibly be tolerated.

It may sound paradoxical but some young people decide to join the medical profession almost by accident, as it were, for reasons not immediately bearing on medicine. Such has been the case even with some famous physicians. S. P. Botkin, the great Russian medical scientist and practitioner, founder of an illustrious internist school, had first entered the mathematical department of a university and only later “defected” to medicine. Joseph Lister, the father of antiseptics, had joined the medical profession prompted by a desire to “work for the benefit of his neighbour”.

The eminent French experimental surgeon René Leriche writes in his memoirs that he was impelled by the idea of placing himself at the service of the suffering humanity, so vulnerable in the struggle against that horrible monster, disease.

The outstanding Russian surgeon A. A. Bobrov decided to become a doctor after a traumatic experience in his boyhood when his mother died of a severe burn....

A mistake made in choosing any profession is always fraught with dangerous consequences. These are truly tragic when a young man decides to become a doctor without possessing the right character traits and aptitudes.

As M. P. Konchalovsky, one of my teachers and a fine therapist, put it, “One may be a rotten writer, or a mediocre artist or a talentless actor, but it is criminal to be a bad physician, for in that case one may easily become a killer”.

I always remember these wise words as I study the faces of young boys and girls during the interviews preceding the entrance exams to our institute.

Unfortunately, no clearly defined criteria are yet available to help medical institute pick the best human material for fashioning future physicians. In my opinion, psychiatrists, neuropathologists and psychologists should have long ago taken up this all-important problem. I believe the optimal selection of medical students is quite feasible provided the problem is tackled from a sound scientific position.

Upon enrolment, the bright-eyed youths and girls become the institute’s responsibility. Now the faculty members have to do their best to train them into good specialists.

No textbook can ever replace the lecturer’s living word. A lecture, apart from supplying new knowledge, fosters the students’ interest in science, stimulating an imaginative approach and enquiry. I believe that lectures will continue to be an effective



method of transmitting knowledge to the students for quite some time yet. The impact of a lecture depends wholly on the lecturer's experience, his skill of delivery, on his ability to present the material in an easy-to-comprehend way within the allotted time. A good lecture is one that is free of cliches, full of new data not to be found in textbooks and manuals, and backed up by good illustrations (operations on experimental animals, case demonstrations, slides, film strips, etc.).

In 1965, as an experiment, we introduced an integrated series of lectures on a variety of clinical disciplines. For a start we chose a fairly common theme: "Rheumatism. The current state of the problem." The difference was that the lectures on this theme were given by three specialists and not one, as formerly. A therapist, a pathologist and a cardiologist. Each covered the theme from the angle of his particular discipline and although attendance was optional the auditorium was always full. Encouraged by the initial success we organised similar lectures on a few other themes. All of them were a success.

It is common knowledge that attendance rate at lectures largely depends on the lecturer's standard. I believe that the head of a department should give most of the lectures. Moreover that each lecture should be an event, a "happening" for the students.

S. S. Yudin often emphasised that, "the surgeon-lecturer faces tasks akin to those facing the actor".

Each one of us had a favourite teacher of whom we retain fond recollections many years later. College students must have favourite professors, for it is they that infect young people with their love for their speciality. That is why I would like to describe some of my colleagues, who have a genius for winning the hearts and minds of their students.

The conquest of medicine starts with the biology course. In this respect, students of the First Medical Institute can consider themselves particularly lucky. The biology course is taught by Professor F. F. Talizin, who is head of the biology and general genetics department. His idea is that science is a continuous motion and uninterrupted development. Before starting a lecture he brings the students up to date on the latest advances in his field. Needless to say, it is crucially important to cultivate a sense of the new in the would-be physician, to foster a thirst for new knowledge.

Talizin's delivery is simple and lucid. He has done a lot of travelling in Siberia, the Soviet Far East, India, Ceylon, and Mexico and his lectures are always accompanied by demonstrations of stuffed animals and birds and tissue preparations. He

tells his audience about his observations and interesting episodes on the journey. All this makes his lectures an exciting and memorable experience.

Professor V. G. Yeliseyev, head of the histology department, a tall and imposing man with heavy features, walks into the auditorium with an air of solemnity. His assistants are at his side. The students hang onto his every word. The secret does not lie in any special manner of the lecturer's delivery. Yeliseyev speaks slowly, clearly, with the minimum of gestures, illustrating what he says with drawings that he sketches on the blackboard. This makes his lectures convincing, and graphic. If Professor Yeliseyev sees that the students' attention is flagging, he tells them an interesting episode or cracks a joke. Yeliseyev's control of the students' attention is the result of his thorough preparation.

Pathological anatomy is an important link between theoretical and clinical disciplines. The students begin this course in their third year. Pathological anatomy is taught by Professor A. I. Strukov, an eminent scientist, Member of the USSR Academy of Medical Sciences. Anatoly Ivanovich is widely acknowledged as the Soviet Union's leading pathologist. His numerous works deal with TB, hypertensive vascular disease, atherosclerosis, myocardial infarction and diseases of connective tissues. Professor Strukov was the first pathologist in the USSR to introduce sophisticated histochemical methods to practical pathological anatomy. His textbook has been used as a standard manual by many successive generations of medical students. But his real element is the lecture-hall. Normally, a few minutes before a lecture, his assistants set up an epidiascope. The professor launches into his lecture as soon as he takes up his position on the rostrum. He does not seek to inundate his audience with too much factual material and never repeats what the textbook has to say. Rather, he seeks to help the students to develop their medical thinking and gain an insight into the pathological mechanisms of various diseases citing data obtained by electronic microscopy and histochemistry.

Professor S. V. Kurashov's lectures were just as popular with the students, who often applauded enthusiastically at the end of one. A talented organiser of the health services, he successfully combined his duties as Minister of Public Health and teacher. The auditorium was often the place where he voiced his thoughts and presented his new ideas to improve the practical aspect of the Soviet health services.

The social science department plays an important part in the ideological and political education of the would-be physicians. This department was for many years headed by Professor I. A. Pashintsev, a veteran Party member, who graduated from the Institute of Red Professors back in the 1920s. An expert in hygiene, Ivan Alexeyevich, had some major philosophical works to his credit. He was able to reveal the essential link between philosophy and medicine, illustrating it with specific examples from his medical experience. Pashintsev impressed upon the students the idea that a good physician should also be a public-spirited man, a propagandist of Lenin's great ideas and to be active in the countrywide effort to build a communist society. Members of the Russian medical profession, he said, had always sought to be with the people, helping them by word and deed. He reminded the students of what Alexander Ivanovich Herzen wrote in a letter to his son, Alexander Herzen, the physiologist, "It is my natural wish that you should travel the road trodden by the feet of our kinfolk, for if you do, you will achieve what Doctor Pirogov, one of Russia's most illustrious sons, has achieved first as a welfare worker in Odessa, and later in Kiev, all of which does not prevent him from being Russia's best surgeon."

Professor Pashintsev was uncompromising in blasting the idealist and metaphysical theories, current in Western medical circles.

### The Mainstay

As I now look back over past years, I often think of my time as a professor at the First Medical Institute and that invariably leads me to the conclusion that it is the assistant professor who plays the decisive part in training would-be physicians.

Indeed, it is the assistant professor who supervises practical sessions in the laboratory and in the wards, it is he who helps the students take their first steps in medical research. An assistant professor is expected to continually extend his horizons, participate in research and keep abreast of the latest developments in related disciplines. Above all, he is expected to put his heart and soul into training the students.

There is a great difference between theoretical sessions in the auditorium and those conducted in the clinic at the patient's sick-bed. In the ward, one should always remember that one is dealing with a human being who is listening carefully to conversations between the doctor in charge and the students, for clues about the

outcome of his affliction. During practical sessions and seminars, in the auditorium, the assistant professor is free to discuss all aspects of a particular disease, its course and expected outcome without resorting to euphemisms; he cannot do so in the ward.

The assistant professor has a tight schedule particularly if he works in a clinical department. He is expected to attend his professor's lectures, help students with a poor academic record, give consultations at examination time, help would-be physicians with their research work, apart from acting as a doctor on duty in the clinic.

Assistant professors are the backbone of the department staff. They are closest to the students, they know better than anybody else each student's strong and weak points. Assistants are the bulk of the institute's teaching staff. Their knowledge, general cultural level and scientific and public work shape their department's reputation. A good teaching staff includes both experienced instructors and those new to the job who are fresh from the post-graduate course. The experienced teachers are expected to help their young colleagues improve their teaching skills and in general prepare them for the time when they will have to take over. The situation is unsatisfactory when a department's teaching staff is made up of middle-aged assistant professors alone, or of yesterday's post-graduates alone. It is important that a happy balance be struck.

That this is so has been made clear to me by personal experience. I once agreed with the arguments of some members of the institute's personnel and as a result, two assistant professors who had reached retiring age but who were still going strong were pensioned off. To this day, I regret that decision. We lost two experienced assistants who could still do several years' teaching and the students were clearly worse off after that. The loss was all the more painful since one of them was a top expert in a very complex discipline, topographic anatomy and operative surgery.

Generally speaking, one has to have a gift for teaching. I remember what Professor Konchalovsky once said to one of his assistants after a round of the wards, "If only you were able to transmit at least half of your knowledge to your students, they would be on the road to becoming famous physicians."

This assistant professor eventually worked himself up a very high professional standard, but he failed miserably in his teaching job.

Members of the staff who are talented teachers must be encouraged in every way. If an assistant shows promise as a teacher, he should be promoted to docent status.

One of the assistant professors we had at the department of faculty surgery left a deep imprint on the minds of all who knew him, both students and members of staff. He was Mikhail Alexandrovich Bubnov whom I mentioned earlier. He was an extremely kind man but when it came to work he was uncompromisingly exacting. He was well-loved and very respected in the clinic.

In my opinion Bubnov could swear as a model high-school lecturer. A fine clinician, a brilliant diagnostician and a master surgeon with an amazing operative skill, he was a worthy pupil of Burdenko. Students swore by Bubnov, for they saw in him a paragon of selfless devotion to medicine.

I remember the following episode. A woman worker was admitted to our clinic with a chronic appendicitis, exacerbated by infiltration that had reached resolution stage. The case seemed quite ordinary and the woman had for some time been under the observation at her own district clinic. She had spent some time at a Moscow hospital but refused to have an operation and had insisted on going home. But pains continued to bother her and she agreed to be admitted to our clinic. The student who was assigned to study her case noted that the infiltrate inside her abdominal cavity was shifting. Besides, the woman complained that the pain had spread to the small of her back. The student duly informed Bubnov, who then had a panoramic X-ray photograph made of the patient's back. To the student's surprise, the X-ray showed unmistakable signs of tuberculosis of the spine. To him, at least, the diagnosis was a real eye-opener. After completion of the course, our student went on to work at other clinics but continued to attend sessions at the faculty surgery and participated in the treatment of that woman patient. With great diligence, he learned to apply a plaster cast and later, on Bubnov's request, he went to see the manager of the woman's factory and obtained accommodation for her at a sanatorium for TB patients.

This episode is another example of Bubnov's style. While remaining in the background, as it were, he cultivates in his pupils an inquiring mind and independent thinking, as well as fostering a love for the physician's profession and a humane and considerate attitude to the patient. With a teacher like Bubnov no student could later develop into a physician bureaucrat who goes about his duties perfunctorily.

Bubnov also enjoyed his joint operations with interns who were recent graduates half-way through their course. Nothing seemed to escape his attention. Whenever necessary, he could, with characteristic tact, tell his younger colleagues what was to be done and how. At critical moments, Mikhail Alexandrovich, concerned for his charges, sometimes became irate. But towards the end of the operation, an atmosphere of friendliness and warmth was restored. Bubnov, a master surgeon with a wealth of experience, had a genius for being in good rapport with freshers.

Bubnov always had his ear cocked when students talked to patients, were they not giving too much information about the patient's illness and treatment? Were they taking patient's mental condition into account? An ill-timed comment or an incautious remark may extinguish the patient's hope for recovery and actually kill him.

To back up his argument against giving away too much in conversation with the patients, Bubnov often cited the conversation between the wounded Pushkin and Doctor Scholtz who was the first to examine the mortally wounded poet at his flat in Petersburg: "What do you think, Doctor, I felt a violent blow in the side and then a stinging pain through the small of my back. I also lost plenty of blood on the way here. Tell me frankly, what do you think of the wound?"

"I'll be quite frank with you, your wound is dangerous."

"But is it fatal, Doctor, tell me the truth."

"I think it my duty not to hide it from you. However, let's hear what Arendt and Salomon may have to say. They should be here any moment."

"Thank you, Doctor. You are an honest man," said Pushkin, mopping his brow with his hand. "Now I have to attend to my domestic affairs."

When Arendt arrived and examined the wound, Pushkin asked the same question, adding that no matter what the answer would be, it could not possibly frighten him, since he had to know his true position in order to be able to wind up his affairs. "If this is the way you want it," replied Arendt, "I must admit that your wound is very dangerous and to be quite frank, I don't hold out much hope for you." Pushkin thanked Arendt for his frankness and asked him not to tell anything to his wife. As he left, Arendt said to Danzas, Pushkin's intimate friend, who was also his second in the duel, "Things look bad. He will die."

Today, over a hundred years later, the controversy is still smouldering as to whether the doctors who examined the wounded

poet were wise to have been so frank in telling the gravely wounded poet that he was beyond hope of recovery.

During practical sessions conducted by Bubnov the students hotly debated the wisdom of Pushkin's doctors. Some of the students condemned them for their cruel frankness, while others thought they were doing the right thing, arguing that in Pushkin's day few physicians gave serious thought to the patient's state of mind preferring to state the verdict bluntly. Concluding the debate, Mikhail Alexandrovich said that in his view, Pushkin's doctors were too frank. He believed that the graver the condition of the patient, the more discretion and tact should be exercised by the physicians who examined him. In some cases, the doctor is well advised to hide the bitter truth from the patient and is even allowed some white lies. As an eminent Soviet surgeon V. A. Oppel wrote, "Frankness carried to the point of cynicism cannot help the patient mobilise his strength against his affliction."

Bubnov would then proceed to say that it did not mean the doctor should always conceal the truth from the patient. The less serious the disease, the more reason there was for the doctor to tell the truth. To win the patient's confidence, the doctor should be sufficiently frank with him. A frank conversation with the patient, far from scaring him off, stimulates an atmosphere of trust between doctor and patient. Bubnov liked to quote the sage wisdom, "Do not do to the patient what you wouldn't do to yourself or to your nearest and dearest."

The relatives of a terminal patient should always be spared the bitter truth no matter how insistent they may be in demanding it. The parents of a fatally sick child must never be deprived of hope for his recovery. Even though the tragic outcome may be inevitable, the parents must not be allowed to be constantly racked by mental pain as they await the arrival of the fatal day.

Speaking about the general public's confidence in and respect for the physicians, Mikhail Alexandrovich emphasised that under no circumstances was this confidence to be abused or negligence shown to the patient. Doctors who violate this rule are guilty of criminal dereliction of their medical duty. In this way, Mikhail Alexandrovich introduced his students to deontology, the science of medical ethics. He not only told the students how one should speak to patients, but actually arranged practical demonstrations of the art. As the great Russian educationalist K. D. Ushinsky put it, "The educationalist's personal example is like a sunbeam for the young soul, an indispensable teaching aid."

Professor A. P. Sorokin recalls: "I shall always remember my encounters with docent Bubnov. Here was a veritable medical magician. Mikhail Alexandrovich supervised my practical sessions. At one point, I had to look after patients with chronic purulent inflammations that did not respond to treatment. Normally, such patients were given up as hopeless cases. I lacked experience and knowledge, and yet I yearned to do something to alleviate their suffering. In those days, penicillin was at the peak of its glory as the wonder drug. But large doses of it were not much help for one of these patients. She had bad osteomyelitis of the shin-bone, and the disease progressed. The patient was wasting away before our eyes. I asked Mikhail Alexandrovich for advice. After discussing the case and examining the patient, he recommended that we stop giving her penicillin injections, along with all the other drugs that had been prescribed earlier. Instead, he recommended egg-shell powder, a circular novocain block at the thigh and smearing the skin surface of the good leg with iodine. He explained his decision thus: the microbes, he said, had apparently developed resistance to penicillin, while the patient's organism was unable to conquer the disease, probably because too many drugs were being injected and the suppurative focus was constantly generating additional pathological reflexes. It was necessary to support the patient's organism with high-caloried food, while the new set of prescriptions would cheer her up, stimulating confidence in her ultimate recovery. The novocain block would eliminate the pathological reflexes while the iodine would stimulate the restoration of the reflex reaction by irritating the skin surface of the good leg. I was amazed at the simplicity of his recommendations, but followed them to the letter and even personally supervised the simple procedures like smearing the skin of the good leg with iodine. We were all amazed and gratified to find that after two weeks of the new course of treatment the patient was able to leave her bed and later was able to dispense with crutches."

Bubnov was repeatedly elected secretary of the institute's Party Committee. That was an indication of the high regard in which the institute's staff held him. Unfortunately, he had a short life. Apparently, the grim war years and overwork in the immediate post-war years, when he worked intensively on his doctorate, at the expense of rest and sleep, while performing all his other duties at the institute, had precipitated his death.



## II. WORKING AS A TEAM

*The teacher faces the most responsible task of all, that of moulding the human personality.*

*M. I. Kalinin*

### The Academic Council

We are carefully maintaining the fine traditions of our institute, one of the oldest of its kind in Moscow, revering the memory of such shining lights of Russian medical science as N. I. Pirogov, I. M. Sechenov, N. V. Sklifosovsky and others. At the same time we pay tribute to our illustrious contemporaries, professors P. K. Anokhin, B. V. Petrovsky, D. A. Zhdanov and many others who have at different periods worked at our institute. Indeed, our institute is a modern, progressive seat of higher learning.

Every year some of our professors and teachers reach retirement age and leave the institute. The posts they vacate are filled by their successors, some of whom have risen from the ranks of our faculty and some are invited from other medical colleges. A new generation of students are admitted every year as the graduating students leave their alma mater.

Along with the changing faculty and student body the tasks facing the institute are changing too and their range is constantly expanding.

Appointments, promotions, defence of dissertations and many other important matters relating to the institute's academic activity are discussed and decided at meetings of the Academic Council which is the institute's supreme consultative body. Members of the council include, apart from the prorectors and faculty deans, department heads and their deputies, and representatives of the institute's different public organisations. In fact, the Academic Council is a very representative and authoritative body.

It has been a good tradition for many years now to acquaint members of the Academic Council with a new book written by one of their colleagues. This is normally done before the formal opening of working sessions. I remember, for instance, how

members of the council warmly congratulated Professor E. M. Tareyev on the publication of his fundamental manual on kidney disorders. Professor Tareyev had spent a good many years working on it. Shortly afterwards he was awarded the Lenin Prize for the work. An equally warm reception was given to the textbooks by A. L. Myasnikov on internal diseases, by V. I. Struchkov on general surgery and by A. I. Strukov on pathological anatomy. These textbooks are now standard reference works for the country's medical students. It gave me pleasure to feel myself a member of a collective that produced such fine manuals for use by students and general practitioners.

The Academic Council hears progress reports on the academic, research, clinical, ideological and educational activities of the faculties, and also reports on the work of the student scientific society. It holds competitions to fill vacancies for professors and instructors as well as elections for faculty deans. A wide-ranging discussion of students' practical work is a standard feature of the Academic Council's deliberations, as are discussions of ways and means for improving the ideological and political education of the students. In addition, the Academic Council hears reports on the financial and economic aspects of the institute's activities.

My own experience suggests that perhaps the most important and responsible sessions of the Academic Council from the rector's point of view are those held at the start of the academic year and at the end of it when the chairmen of the examination boards appraise not only the graduating students but also the performance of the individual departments and the institute as a whole. At these sittings of the Academic Council officials of the Ministry of Public Health, who had acted as chairmen of the state examination boards, most of them independent and authoritative scientists, offer criticisms which are worthy of serious attention.

Most members of the teaching staff and the bulk of the institute's clinicians attend the council's meetings at the start of the academic year. Everyone wants to know latest achievements in scientific, clinical and academic activity the past academic year produced. They also learn about their new tasks for the new academic years, about any changes which have been made in the curriculum. At one such meeting the rector reported that the Ministry of Public Health has raised the question of introducing a sub-internship scheme for senior students, as well as intership for graduate students with diplomas. The Minister of Public Health had asked us to give our opinion on this important question since

our institute had gained a certain amount of experience in the initial specialisation for sixth-year students.

We always do our best to help the students equip themselves with as much theoretical knowledge and practical skills in their particular fields as possible. Specialisation procedures were a standard feature for five years. Time has since shown that internship is a progressive form of training physicians and one with clear advantages over the system of training general practitioners.

Members of the Academic Council gave their full backing to the Ministry's initiative, which was designed to raise the standard of doctors trained by our institute. True, this reform was expected to lengthen the course by one year. The final year interns with doctors' diplomas spend working under the supervision of qualified specialists at a major hospital. This arrangement ensures that the young physician comes to his hospital after a period of initial on-the-job training in his particular field and not fresh from the auditorium as formerly. This new form of training held out great promise. But in the final analysis everything depended on efficient organisation. That was where the professors and the institute rector had to do a lot of hard thinking.

Indeed, specialisation tends to change the students' attitude to their practical sessions in the clinic. Whereas under the old system of training general practitioners it was not easy to talk a student into attending lectures on such disciplines as diseases of the ear, throat and nose, eye diseases or dermatology or stand night duty at ambulance centres or maternity homes, under the new system students who had decided on their future speciality could not be persuaded to leave the clinic at the day's end.

Apart from matters relating to academic work, the council often discusses problems related to the construction and repairs of the institute's buildings that has been undertaken in accordance with the relevant government decision. This latter question affects the whole of the institute's staff from nurse to professor. Discussions have often developed into heated arguments with some suggesting a totally new design for the institute and in fact moving it to a place beyond the city limit; while others insisted that the best course of action would be to revamp the old buildings. That would be far easier to do and entail less expense. Finally a compromise decision was passed whereby apart from reconstruction and alteration of the existing buildings several new buildings were to be put up in a nearby district of Moscow. Thus the Academic Council, alongside its scientific and academic concerns, helps the institute's management and Party Committee solve complex questions

relating to the building of new clinics, theoretical departments, housing accommodation and hostels for the students.

It should be remembered that when these questions were first raised, the country was still grappling with the aftermath of the war and building operations called for strenuous efforts and substantial outlays. Fortunately the City Council, Party and government organisations helped us in every way possible.

You may think it strange that the institute's rector and its Academic Council should deal with things like building. After all this is the direct responsibility of specialised organisations and building engineers. This is so, but we at the First Medical Institute have long had a tradition of showing concern for everything, and surely the clinics, the hostels and the blocks of flats for our staff are a matter that should be attended to.

### The Rector's Office

Efficient day-to-day guidance of a large medical institute is unthinkable without constant help from public organisations, deans and department heads. It was a tradition with us to meet every tenth day for a discussion of current problems. The meetings were arranged by the Rector's Office and dealt with urgent problems affecting the institute's life. Those present heard progress reports on the performance of the various services and units of the institute and on the fulfilment of the capital building and repairs plan, equipment of clinics, auditoriums, etc., with everything necessary and so forth.

The Rector's Office is something in the nature of a collective management body guiding the activities of the huge institute and it is this spirit of collective decision-making that is its main strength. Members of the institute's staff helped me reach correct decisions on the problems and, most important, implement them.

Today as I look back on my ten-year term as rector I often recall those who were my closest helpers.

For many years A. Z. Belousov was the prorector looking after academic matters and building. I had worked side by side with him in the same Komsomol organisation back in the 1920s when he was Secretary of the institute's Komsomol branch. Belousov had retained his love of working with the young. It was not easy to find him in his office. He was omnipresent. Most often one could find him surrounded by students and teachers. I never stopped marvelling at his capacity for work, at his efficiency, his ability to combine guidance in academic matters with supervision of the

construction of new buildings, student hostels, clinics and housing accommodation.

Professor V. M. Banshchikov was for many years prorector responsible for research. A psychiatrist by training he also headed the Korsakov Clinic, one of the country's leading mental hospitals. A man of rare self-control and even-handedness, Professor Banskchikov was an extremely cooperative prorector with an intimate knowledge of every aspect of the institute's scientific activity. One of his merits was an ability to arrange scientific conferences and organise the publication of our staff members' scientific works. On the other hand, in our opinion, he did not visit the various departments often enough. He remained adamant, maintaining that the department heads should be allowed maximum elbow room and independence. Like Belousov, Banskchikov was in love with the institute and did a lot to improve its work.

I have told you about two of my former prorectors with a reason. I am convinced that any institution of higher learning, including medical institutes, can only hope to perform its functions provided scientific and academic processes are closely integrated with each other and supervised by top experts. I am convinced that the higher a department's standard in research, the more successful are the institute's overall training and educational activities.

Despite students' considerable workloads, what with practical sessions, lectures and various public obligations, they still have enough spare time, particularly senior students.

The institute's rector and his assistants have to do a lot of thinking about how to put that time to the greatest use. Some 2,000 students out of the total of 8,000 studying at the institute are members of student scientific groups set up in the various departments. At experimental departments, where one can actually stage experiments on laboratory animals, enrolment in scientific groups is far higher than at purely theoretical departments. Many of the students use their spare time to visit clinics, acquire proficiency in sophisticated methods of diagnostics and treatment, do night duty at obstetrics departments, emergency surgery wards, etc.

After obligatory sessions and lectures at the institute some of the students go to their clinics, others to the laboratory where they sit up late into the night doing experiments or assisting in operations. What is important, however, is to ensure that they do not turn into hermits interested only in their narrow fields, but have enough time for recreation, for visits to the theatre, museums and angaging in sports.

The bulk of the students join amateur dramatic societies and various artistic groups. To help these students develop their artistic tastes and ability our institute has enlisted the services of professional theatre directors, actors and artists. The concerts given by our amateur talent groups are always a joyous event.

During the summer vacations members of our amateur talent groups usually go on concert tours into rural areas sometimes a long way from Moscow, the virgin lands for example. In the autumn they return to Moscow happy and content realising that they had done their duty to those who till the fields and build major construction projects. The secretary of the institute's Komsomol branch presents the amateur artists with honorary diplomas and thanks them on behalf the institute for fulfilling their Komsomol assignments.

The student detachments sent out by our institute to the virgin lands do a good job helping with the harvests and building living quarters, livestock farms, etc. I still remember 1958, when a bumper grain harvest had been grown in the virgin lands and our institute sent a student detachment 300 strong led by some of the instructors. The man in charge of the detachment was docent L. V. Metelitsa, a member of the institute's Party Committee. In the beginning we had thought that it would be ill advised to send the students unaccompanied by teachers. We were afraid they might not turn up for work and play hooky. That is why the first student detachment included assistant professors and post-graduate students. However, as time went by we saw that the students were a responsible lot, sufficiently well disciplined and willing to rise to the occasion. Metelitsa did the right thing when he granted the students in his charge complete independence, making them fully responsible for the work and assigned the experienced doctors to work at local hospitals or else with student detachments from non-medical colleges.

Our detachment was sent to Kokchetav Region in Northern Kazakhstan. From dawn to dusk the students were to unload endless lorries laden with grain. It was then that the students for the first time in their lives learnt the true cost of their daily bread. The night shift was particularly hard.

The concept of friendship took on a new dimension in the virgin lands. Whereas back in Moscow a good friend was the one who was prepared to give his fellow students a crib or let him copy out his notes, in the virgin lands a true friend was he who was willing to lend a hand with the heavy work. For instance, a group of girls once

had to work all through the night. Two boys, Vadim Verbov and Valery Vysotsky were returning home after a stint of unloading. Although they were dead tired, they decided to help the girls and worked side by side with them all through the night.

I remember one occasion when a fire started in the steppe. Most of the boys did not know what to do. Two of them, Viktor Korpushkin and Valery Venevtsev, quickly organised a fire fighting team and within half an hour the fire was put out and the grain crop saved.

Here is what some of the students write about their experience of work in the virgin lands, "That was a tough exam for us all. Of course, no marks were credited to us and our performance did not earn us any privileges in the shape of larger maintenance grants, still this experience taught us a good lesson. Above all it helped us gain confidence in our fellows and taught us to be intolerant of shortcomings. We became more responsible and more disciplined, developed a team spirit and matured as adults."

While at the institute the would-be physician has to cultivate will-power, build up his physical strength and in general acquire useful habits and develop stamina that will stand him in good stead later when he will have to spend long hours at the operating table or maintain a night vigil at his patient's sick-bed. It would also come in handy when in bad weather and in the absence of roads a young doctor may have to reach a remote village or a roving party of prospectors to provide urgently needed medical help. I believe that the students' manual work during summer holidays directly contributes to this goal. The years the student spends at the institute are only a milestone in his professional career which makes exacting demands on his spiritual and physical strength.

### **Departmental Research**

The main fields of research are determined by a long-term plan prepared by the Academy of Medical Sciences. The institute's professors, instructors and research workers, 1,000 in all, working in a variety of theoretical, clinical, and hygienic disciplines have available to them extensive opportunities for comprehensive research on the junction between the most different branches of medicine.

The crucial problems tackled by the various departments are the prevention and treatment of cardiovascular and gastro-intestinal

diseases, malignant neoplasms and other formidable diseases. Anaesthesiology and resuscitation are also claiming a lot of attention. The clinics continually perfect and develop methods of diagnostics and treatment.

The extensive programme of research into cardiovascular diseases is based on modern methods, such as selective angiography for instance, coronarography—radiological investigations of the arterial vessels of the heart, sophisticated biochemical techniques and a variety of electrophysiological methods. In-depth research is carried out into immune and haemodynamic changes and also into the effect on them of current chemodrugs.

The development of measures against deficiency of blood circulation is attracting close attention from the institute's therapeutic departments. The combined treatment (cardiacs combined with drugs normalising metabolism) has been clearly demonstrated to be superior to cardiac therapy only. Disturbances of individual aspects of metabolic processes within the heart muscle have been studied and their significance determined for the development of cardiac deficiency. Great attention is given to studying ischemic diseases of the heart and myocardial infarction and the effect of various preparations normalising the heart rhythm. The findings obtained indicate the possibility of detecting the early symptoms of heart deficiency in patients suffering from ischemic heart disease with the aid of sophisticated instruments and radiological techniques.

The institute's departments have been traditionally working on problems of anaesthesia. Back in the middle of last century, when the narcotising effect of ether and chloroform first became known, the surgical departments working in close cooperation with pharmacologists and chemists of the medical faculty provided a scientific substantiation for anaesthesia and introduced it into general use. Achievements in this field are passed on from one generation of medical scientists to another. In the early thirties new anaesthetics made their appearance and techniques for their application were developed including gas narcotics (narcilene, ethylene), intravenous preparations such as evipan and a series of barbiturates, sovcaïn used to prolong the duration of spinal anaesthesia, cyclopropan, and curare. Of late intratracheal anaesthesia has been used on an increasing scale.

The theoretical and applied aspects of anaesthesia are studied by the department of pharmacology. Research in this area is



associated with the name of V. V. Zakusov, an eminent neuropharmacologist who for many years was in charge of the department. V. V. Zakusov has founded a large school of pharmacologists. Today the department is headed by Professor D. A. Kharkevich, one of his pupils, who is now developing his teacher's ideas. Using up-to-date methods of inquiry the department's research workers are looking into the mechanisms of the narcotising effects of a variety of anaesthetics and other drugs affecting the central nervous system. New drugs are constantly being sought. In cooperation with chemical experts from the Institute of Pharmacology of the USSR Academy of Medical Sciences, the department has developed a series of new drugs for use in operations. One of them is sodium oxybutirate, another anatruxonium, a substance of the curare type that paralyses muscles, and still another, gigronium, which is used for lowering arterial pressure. The pharmacologists who developed these drugs have taken out patents. Professor D. A. Kharkevich was awarded the Kravkov Prize for his research into the pharmacology of the nervous system. N. P. Kravkov was the founder of Russian pharmacology.

The department of pharmacology works in close contact with the clinics which benefits both clinicians and pharmacologists, speeding the solution of many key problems and stimulating the generation of new ideas.

Other departments of the institute are also developing problems of anaesthesiology with considerable success, evolving novel anaesthetic methods. Thus, researchers in the department of faculty surgery, which is headed by Professor M. I. Kuzin, have come up with a new anaesthetic technique known as electronarcosis. The mechanism of its action is based on inhibition of the cerebral cortex, notably, the sensomotor zone. A suitable apparatus has been designed for administering electronarcosis, including an automatic version. Both variants have been duly patented.

Experience has shown the reliability of the new device, and the researchers are now looking for currents with optimal physiological parameters, which could induce inhibition with minimal side-effects. Radioscopic investigations during anaesthetic procedures are given close attention, as are the testing of new drugs. Further research is being done into the effect anaesthetics have on renal function and blood coagulation. A careful study of the behaviour of the various organs and systems during anaesthetic procedures will eventually help develop anaesthetic techniques for patients suf-

fering from chronic disorders of the liver, kidneys and other vital organs.

Among the research projects dealing with the introduction of the up-to-date anaesthetic techniques into the specialised departments of clinical medicine, those concerned with general anaesthesia in surgical and therapeutic stomatology are developed by the department of maxillofacial surgery headed by Professor N. N. Bazhanov. As a result, more rational and efficient general anaesthetic techniques have been developed for use in stomatology particularly for patients suffering from attendant cardiac and pulmonary diseases.

The institute's scientists have done well in developing new and perfecting existing diagnostic techniques. Take, for instance, bronchoscopy. Professor V. N. Vinogradov has convincingly demonstrated its advantages over other methods of exploring bronchi. The new technique has been further perfected in the therapeutic clinic and later introduced into general use.

Investigation of patients with bronchial and pulmonary disorders using the bronchoscopy technique has produced encouraging results. Thus as many as 83 per cent long-term remissions have been secured among a sample group of patients with pulmonary suppurations. In some cases the bronchoscopy technique is used as a preliminary to radical lung surgery.

The institute's surgical departments understandably provide the lead in developing new operations on the lungs, esophagus, heart and blood vessels. Professors B. V. Petrovsky and V. I. Struchkov have pioneered a series of novel and ingenious operations which have won them the country's highest award—the Lenin Prize.

The general surgery clinic headed by Professor V. I. Struchkov has worked out a heart probing technique coupled with a contrast exploration of pulmonary blood vessels. Experiments have revealed distinct points of difference between suppurative disorders of the lungs and lung cancer. The search for a method of measuring blood pressure inside the heart and the larger blood vessels is of crucial practical importance for deciding on radical surgery to eliminate chronic suppurations. An improved anaesthetic procedure in bronchoscopy that reduces its danger has been developed.

The institute's hospital surgery clinic has always been active in all national surgical congresses. Ever since the time of professors

P. I. Dyakonov, A. V. Martynov, P. A. Herzen and later professors M. N. Akhutin and V. E. Salishchev, our clinic has been developing the surgery of the heart, blood vessels, liver, bile ducts and the thyroid gland. There was a time when P. A. Herzen dreamed of heart operations, specifically for correction of congenital and acquired heart defects. The clinic of hospital surgery in cooperation with the Institute of Experimental and Clinical Surgery has carried out over three thousand such operations.

A series of ingenious operative techniques have been developed for correcting congenital and acquired heart defects. One method involves access through the right auricle for suturing defects of the interventricular septum. The clinic has performed successful operations, employing ball-type prostheses to replace damaged heart valves. V. I. Shumakov has developed prostheses for the mitral, tricuspid and aortic heart valves.

The method of replacing damaged sections of the heart following a myocardial infarction with flaps of the diaphragm suggested by B. V. Petrovsky has won wide recognition and is used both in the USSR and abroad.

Research is being done to develop an artificial heart and heart transplantation operations. Problems of reconstructive and restorative surgery of the esophagus, stomach and intestines are being studied. A number of ingenious operations have been developed for a shortened esophagus and for hernias of the esophageal aperture of the diaphragm. Restorative operations for malignant tumours on the esophagus are also being explored.

The institute's scientists have achieved notable success in their efforts to perfect reconstructive and restorative operations on respiratory organs. M. I. Perelman, A. P. Kuzmichev and others have performed over 100 operations for resection of bronchi. Experiments are being staged in the field of lung transplantation.

Professor N. A. Preobrazhensky was the first to successfully perform a delicate plastic operation on the middle ear completely restoring hearing. Soon afterwards this operation was introduced into clinical practice, as a result of which many deaf patients had their hearing restored. Professor Preobrazhensky was awarded the Lenin Prize for developing this new operation and introducing it into general use.

Considerable advances have been made in the surgery of vascular diseases. An encouraging start has been made in evolving

new methods of surgical treatment of vascular affections. More efficient techniques for direct reconstruction of coronary arteries in blood circulation deficiency in the cardiac muscle are being developed. Members of the department of operative surgery I. S. Sychenikov, R. K. Aboyants, T. G. Rudenko and others have developed fundamentally novel semi-biological vascular prostheses which preclude blood clotting. New prostheses for replacing blood vessels in infected wounds are being developed.

The main efforts of the institute's research workers vis-à-vis malignant neoplasms are concentrated on the early detection and prognostication of tumours of the stomach, the lungs and mammary glands. Advanced radiological, radio-isotope and biochemical techniques are used to detect incipient forms of cancer and precancerous diseases. Special programmes are being designed for computer processing research findings. The accurate determination of tumours' response to growth inhibiting drugs will make it possible to develop individual drug treatment of malignant neoplasms.

Research is being done in physiology, biology, biochemistry, heredity and controlled biological engineering.

The department of biochemistry headed by Professor S. R. Mordashev is investigating problems of enzymology.

For many years the department of anatomy has been investigating the anatomy of the lymphatic system. Professor D. A. Zhdanov and his team have conducted fresh studies of human lymphatic and circulatory systems, using fundamentally new methods for exploring vessels layer by layer. Drawing on existing data on the normal anatomy of the lymphatic system they investigated its pathology in an effort to obtain more accurate data on the spread of cancerous and inflammatory processes in the human body. Their findings will in turn help to diagnose and treat a number of diseases more successfully.

The staff of the department of pathological anatomy, which includes such outstanding scientists as I. V. Davydovsky, V. T. Talalayev, D. N. Vyropayev and others, are studying problems that are relevant to the practical tasks facing the health services. Whereas formerly infectious diseases, their clinical and anatomic characteristics, were their primary concern, in recent years their efforts have been directed to studying problems of oncology, cardiovascular pathology and diseases of the nervous system.

Professor Strukov and his team are making wide use of advanced methods including electronic, ultraviolet and luminescent microscopy and autoradiography, a technique allowing metabolic processes in a particular organ to be followed through the use of radioactive isotopes. They have studied the morphology of oxydation-reduction processes within the heart muscle in myocardial infarction and performed a comprehensive investigation of collagen diseases (grave progressing diseases affecting the body's connective tissues).

Soviet medical scientists have done a lot to clear up problems relating to atherosclerosis. Research in this field has for many years been conducted by a team of Leningrad physiologists led by Academician N. N. Anichkov in cooperation with their Moscow counterparts led by Professor S. S. Khalatov. They have been trying to show experimentally the dependence of atherosclerosis on excessive cholesterol content. Their experiments have had an appreciable impact on further research in the USSR and other countries. Subsequently professors A. L. Myasnikov and E. M. Tareyev, who headed the institute's therapeutic clinics, have shown that in atherosclerosis protein and carbohydrate metabolism are also disturbed. In recent years the interdependence between hormonal disturbances and atherosclerosis has been established.

The institute's central research laboratory is the main interdepartmental "clearing house". The laboratory was founded by Professor S. I. Chechulin, a pupil of I. P. Pavlov, back in the thirties. The experience of the central laboratory, now named after its founder, has demonstrated the advantages of this type of scientific research organisation. The laboratory coordinates the efforts of researchers in different fields. It has up-to-date, often unique, equipment all of which ensures a high scientific level of research and a reliable and valuable scientific production.

The central laboratory of the First Medical Institute served as a prototype for the creation of 68 similar laboratories at different medical colleges and institutes of advanced training of doctors.

Such has been the contribution of the institute's 74 departments to research in urgent problems of modern medicine.

### III. FINE TRADITIONS

*The more useful the individual is to the state and the public, the more is his human value.*

*D. I. Mendeleyev*

#### Inauguration Day

The fine tradition of the Inaugural Address which took on a new dimension in Soviet times dates back to the founding of Moscow University. The first Inaugural Address at the University's medical faculty was made by Professor I. F. Erasmus back in 1765. Subsequently, Inaugural Addresses were arranged to coincide with landmark events and celebrations to mark successive anniversaries of the University's founding. The audience on such occasions included scientists, men of letters, people prominent in the arts and foreign guests.

The Inaugural Day was a truly public event whose significance went beyond the confines of the University. An idea of the impact which the University's Inaugural Days had can be gauged from the following comment made by V. G. Belinsky, the great Russian literary critic, who wrote in 1838, "The speeches and reports made at the annual Inaugural Day at Moscow University are precious documents of its history as the first and most important seat of higher learning in Russia. Indeed, one can follow its progress and annual successes from these documents as from a living chronicle."

The Inaugural Day tradition initiated by Moscow University was adopted by many other universities in Russia. Today this tradition is kept up by the First Moscow Medical Institute, which is the direct successor and heir to the fine traditions of the Moscow University's medical faculty.

When Belinsky wrote of the annual inaugural days as precious historical documents he doubtless referred to the Inaugural Addresses made by outstanding medical scientists of the first half of the 19th century, like professors M. Y. Mudrov, E. O. Mukhin and F. I. Inozemtsev, to name but a few.

The Inaugural Address made by M. Y. Mudrov in 1820 was a memorable occasion for all present. In his address, which was devoted to the physician's art and bedside manner, the speaker

emphasised the need for a continual search for new knowledge: "No physician worth the name can ever claim complete mastery of his art." Mudrov's words still ring true today. He said, "The task of the physician is not so much to treat the disease as to prevent it and teach people how to safeguard their health." These fine and apt words have since become part of the physician's moral code. Disease prevention has become the basic principle of Soviet medicine.

Professor Mudrov, along with other Russian medical scientists, did not only preach his ideal of a good physician but he also provided a shining example of the performance of medical duty. He volunteered to help combat a cholera outbreak in St. Petersburg and died on the job. In a letter sent to a close friend, a prominent Russian thinker and enlightener of mid-nineteenth century, P. Y. Chaadayev, just before he left Moscow, he wrote, "I am leaving Moscow with a heavy heart. It is hard to have to part with the University. It is hard to leave my dear and near ones, my dear friends, but duty calls me."

The history of Russian and Soviet medicine provides any number of similar examples. Thus, S. P. Botkin, the great therapist of the late 19th century, went to besieged Sevastopol soon after graduating from the Moscow University's medical faculty and there treated the wounded and the sick under enemy shellfire. N. N. Burdenko after completing his course of medicine volunteered to go to the Far East where he took part in the Russo-Japanese war. Soon afterwards he was decorated with the Order of St. George for valour while providing medical assistance to the wounded.

Self-denial and nobility of spirit in the performance of their civic duty has always been a norm of professional conduct for members of the Russian medical profession. Chekhov, who was a doctor by training, wrote, "The physician's profession is a calling requiring self-denial and purity of soul and intentions. It is not everyone that possesses these qualities." Professor S. P. Kolomin, a surgeon, shot himself in 1886 when a woman patient he had operated on died because of his mistake. Although this act cannot be justified, it nevertheless shows the high moral and ethical standards that Russian physicians always applied to themselves.

A young doctor, I. V. Mamontov, volunteered to go to Manchuria as part of a medical team headed by D. K. Zabolotny, an expert on plague. They were to establish the role played by rodents in the spread of the disease. While attending to his patients Mamontov himself contracted pulmonary plague and died. Shortly

before his death he wrote to his mother, "Dear Mum, I think I have contracted some paltry disease, and since during a plague epidemic people as a rule never catch anything but plague this must be it. Dear mother, I feel terrible thinking what an awful blow it will be to you.... I believed that life was the most priceless thing, but I could not run away from a danger that threatened all, just to save my life. It seems, then, that my own death will be a vow to the performance of professional duty."

The fine traditions of Russian medicine are being carried forward by Soviet physicians and medical scientists. M. P. Pokrovskaya and N. N. Zhukov-Verezhnikov have tested a new anti-plague vaccine on themselves, while M. P. Chumakov did the same with anti-encephalitis vaccine. Z. V. Ermolyeva placed herself in mortal peril by experimenting with cholera vibrios.

In the latter half of the 19th and early 20th centuries the Inaugural Addresses at the medical faculty of Moscow University were made by many outstanding scientists who had contributed to developing Russian medical science and enhancing its prestige in the world. They included A. N. Polunin, I. T. Glebov, G. N. Zakharyin and N. V. Sklifosovsky.

The tradition of making Inaugural Addresses has been maintained in Soviet times. On October 11, 1948, the annual Inaugural Address before a meeting of the institute's Academic Council and in the presence of numerous guests of honour was made by Professor I. P. Razenkov, a pupil of I. P. Pavlov, and a member of the USSR Academy of Medical Sciences. The theme on that occasion was "The Role of the Gastro-Intestinal Tract in Metabolism".

I. P. Razenkov is an eminent scientist who has made a substantial contribution to study of the physiology and pathology of digestion. His works retain their significance to this day. A fine teacher, he had many pupils who now develop his ideas on a wide range of physiological problems. Professor Razenkov has trained as many as fifty doctors and eighty candidates of medical sciences. Thousands of physicians in the Soviet Union consider themselves his pupils.

The 1949 Inaugural Address was given by Professor B. I. Zbarsky, Member of the USSR Academy of Medical Sciences, and Professor S. P. Mordashev. They dealt with new methods of studying protein metabolism. B. I. Zbarsky was an extremely gifted medical scientist. He was well known both in the USSR and abroad for his part in the unprecedented project to preserve (mummify) Lenin's body for posterity. Zbarsky and his



pupils were concerned with studying the biological chemistry of proteins in normal and a variety of pathological states (cancer, scurvy, starvation, etc.). He pioneered a method of studying the nutritive value of proteins based on determining the amino-acid content of food proteins. Investigations conducted by Zbarsky were always relevant to the practical requirements of Soviet medical services.

In the fifties, the inaugural addresses were given by V. N. Vinogradov, N. N. Elansky, E. M. Tareyev and others.

On October 11, 1964 the Inaugural Address was given by Professor D. A. Zhdanov, an eminent Soviet anatomist, Member of the USSR Academy of Medical Sciences and a winner of the State Prize. The subject was a review of experimental research into lymphatic capillaries in norm and pathology. The findings obtained by D. A. Zhdanov have been included in many textbooks and manuals and have been used in other countries. Professor Zhdanov is acknowledged as an outstanding anatomist with an imaginative approach and an extremely fruitful researcher of arterial and lymphatic systems. His findings contain many valuable hints for practising physicians.

Inaugural Day at our institute is a festive time for all concerned. On that day individual departments and the institute as a whole review the results of their work. We have revived the fine tradition of announcing the best professors and instructors and encouraging the best students. The best departments and academic groups are awarded challenge Red Banners on that day. In recent years we have instituted in addition a special challenge cup which is awarded to the instructor of the year. The presentation ceremony is held on Inaugural Day too.

Students who have distinguished themselves in student scientific groups or working in the virgin lands and helping in collective and state farms in Moscow Region are awarded special diplomas. Members of the amateur talent group also come in for their share of praise. They have been to Bratsk hydropower station construction site, given concerts for the builders and workers at bumper camps in Siberia and for fishermen in the Soviet Far East. Guests of honour from Moscow and Tula regions where our students spend their practical sessions also tender their vote of thanks.

The political and educational significance of Inaugural Day can hardly be overestimated. The example of our institute in maintaining the tradition has been followed by many colleges and universities across the country.

## Our Glorious Forerunners

In 1965 the Soviet public marked the bicentennial of the First Moscow Medical Institute which until 1929 formed part of Moscow University. On that occasion the institute was awarded the Order of the Red Banner of Labour in recognition of its contribution to the progress of medical sciences and its part in the training of doctors.

At different times the medical faculty of Moscow University has had, as students and lecturers, outstanding scientists and prominent public figures such as M. Y. Mudrov, S. P. Botkin, I. M. Sechenov, N. V. Sklifosovsky and others. In the early 19th century the great Russian surgeon N. I. Pirogov was among its students.

Sechenov's work *The Reflexes of the Brain* had great significance in the development of theoretical disciplines. Sechenov headed the department of normal physiology. His work represented nothing short of a programme of materialistic physiology. Sechenov was the first to provide a scientific explanation for thought processes and consciousness. Later these problems were developed by the great physiologist I. P. Pavlov.

Pavlov wrote, "I am happy that together with Sechenov and troops of my dear assistants we have acquired for the mighty power of physiological investigations a whole living organism instead of just parts of it. This is an indisputable service Russian medical science has done for world science and human thought in general."\* In regarding the human body as a single whole in close interaction with the environment, Pavlov later disclosed the role of the central nervous system in all vital processes.

The closing years of the 19th century were extremely fruitful for the Moscow University's medical faculty. At that time on its staff were the illustrious sons of Russian medical science like N. V. Sklifosovsky, P. I. Dyakonov, A. A. Bobrov, V. F. Snegirev, N. F. Filatov, C. C. Korsakov and G. A. Zakharyin. They often made reports at national and international scientific congresses and conferences. They were instrumental in speeding the completion of a clinical township in Devichye Polye in 1893. The township was the best in Europe in terms of layout and organisation.

The name of N. V. Sklifosovsky, an outstanding Russian surgeon and public figure, is indissoluble from the history of the Moscow University's medical faculty. There is hardly an area of

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\* I. P. Pavlov, *Collected Works*, Vol. 1, 1940, p. 27 (in Russian).

surgery and public health where Sklifosovsky did not leave his mark. A true innovator and man of progressive ideas, he was the first to see the advantages of antiseptics and aseptics and later introduced the aseptic method of treatment into general use. As the honorary chairman of the First Pirogov Congress in 1885, he devoted his speech to antiseptics. V. I. Razumovsky wrote, "Sklifosovsky's speech marked a turning-point from old surgery to new surgery in Russia."

Sklifosovsky, a pupil and follower of Pirogov, continually worked to improve surgical techniques attaching special importance to topographic anatomy. Sklifosovsky was one of the first Russian surgeons to perform laparotomy (section of the abdominal cavity). In 1864 in Odessa, long before the development of antiseptic techniques, he performed his first ovariectomy. Those operations laid the foundation of surgery of the abdominal cavity in Russia.

Sklifosovsky's operations were remarkable for their simplicity and gracefulness of execution. But their chief merit was their clinical expediency. Each patient admitted to Sklifosovsky's clinic for treatment was subjected to a careful and comprehensive examination both before and after the operation. A thorough study was made of post-operative condition and the surgery's impact on the functions of the organ operated upon.

Sklifosovsky was a bold trail-blazer in many fields of medical science. He pioneered the operation for fractures of tubular bones that failed to mend. This later came to be known as the "Sklifosovsky lock". He also developed operative techniques on the urinary bladder, the surgical treatment of cerebral hernias and operations to remove goitres. Sklifosovsky was instrumental in introducing into wide practice chloroform and ether anaesthesia which had been pioneered by Pirogov and Inozemtsev before him. He also helped develop improved local anaesthetics.

Sklifosovsky's clinic was a Mecca for the Russian medical profession. Physicians came here to undergo practical and theoretical training in surgery. According to I. K. Spizharny, a pupil of Sklifosovsky's, in the thirty years of his service with Moscow University, Sklifosovsky succeeded in founding a large surgical school and made his clinic one of the best of its kind in Europe.

Sklifosovsky was an eminent war surgeon. He was held in high regard not only in the medical community but also among Russian intellectuals. His popularity sprang from his success as a clinician, master surgeon and medical scientist and also from his active

involvement in public affairs. Without exaggeration, in the more than thirty years of his medical career there was not a single public initiative or undertaking in the medical world with which he was not associated.

Sklifosovsky's friends included S. P. Botkin and A. F. Koni, a famous Russian lawyer, A. P. Borodin, a composer and a professor of chemistry, and P. I. Chaikovsky. Sklifosovsky met Lev Tolstoy. The outstanding Russian artist of the time, V. V. Vereshchagin, presented him with one of his landscapes with this inscription: "When you feel tired, just look at this picture and it will help you relax."

When Chekhov graduated from the Moscow University's medical faculty Sklifosovsky, then dean of the faculty, presented him with a doctor's diploma.

On August 3, 1897, Devichye Polye in Moscow was the scene of the unveiling of a monument to the great Russian surgeon and medical scientist, N. I. Pirogov. The unveiling ceremony preceded the formal opening of the 12th International Medical Congress, which brought together many eminent Russian and foreign medical scientists and physicians.

Speaking at the unveiling ceremony, the well-known Russian surgeon, P. I. Dyakonov, said, "This first monument to a Russian man of medicine has been erected on money donated by members of the Russian medical community. The tsarist government had confined itself to granting its august consent."

Sklifosovsky, who spoke next, said, "We have entered upon the road of independent life. We have our own literature, science and art, and we have gained independence in every field of culture.... A nation which has produced a scientist of Pirogov's calibre can be legitimately proud of it, because a vivid period of Russian medicine is associated with his name. Pirogov's contribution to medical science will not fade with the passage of time, as long as European science exists, as long as the rich Russian language is spoken here. We do not have a Russian Temple of Glory but if a people's Pantheon is ever created, the great physician and citizen Pirogov will undoubtedly be given a place there."

Sklifosovsky's words have been now proved prophetic. The Soviet people revere the memory of great Russian surgeons of the past, including Pirogov, who did so much to enhance the prestige of Russian science. Similarly, Sklifosovsky himself is fully entitled to a place in the people's Pantheon he spoke of.

If you come to Moscow's Kolkhoznaya Square, you will see a

beautiful architectural ensemble designed by some of Russia's greatest architects of the 18th century, which today houses the Moscow Institute of Emergency Medical Aid. Founded soon after the Great October Revolution, this institute, which is the only one of its kind in the world, bears the name of Sklifosovsky

### The Hippocratic Oath of Soviet Doctors

In keeping with a time-honoured tradition, medical students around the world take the oath of allegiance to their professional duty commonly known as the Hippocratic Oath. Soviet medical students, too, take this oath on graduation.

At the First Medical Institute the oath-taking ceremony is always a solemn occasion. Graduate students and members of the Academic Council fill the spacious conference-hall, then the red banner of the institute, with the Order of Lenin and the Order of the Red Banner of Labour shining on its scarlet velvet, is brought in. A guard of honour take their stand beside the banner. One of the graduates, usually a brilliant student active in public affairs, steps forward and reads out the text of the oath in a ringing voice:

“As I join the ranks of the noble medical profession and embark on my work of health protection, I take this solemn oath:

“to devote all my knowledge and energy to the care and promotion of man's health, to the treatment and prevention of disease, to conscientious work wherever the interests of society demand it;

“to be always ready to give medical aid, to attend to the sick with care and solicitude, to observe the privacy of confidential communication;

“to improve continually my knowledge and skills in medicine, to do my best to contribute to the progress of medical science and practice;

“to request advice, whenever the patient's interests demand it, from my colleagues and never to refuse them advice and assistance;

“to follow and develop the noble traditions of medicine in my country and to be guided in all my actions by the principles of communist ethics, to be mindful of my lofty duty as a member of the Soviet medical profession and of my responsibility to the people and the Soviet state;

“I swear my life-long allegiance to this oath.”

The last phrase of the oath is chanted in chorus by all the graduates.

The text of the oath is issued to every graduate along with a medal commemorating the 200th anniversary of the institute's foundation.

Every graduate will follow his bent. Some will work as practical physicians, others will apply themselves to scientific research, still others will take over from their teachers of yesterday who initiated them into the great art of medicine. They will have their share of hard work, of success and failure, of setbacks and achievements. Each victory over disease and death will be their sweet reward. We, teachers, were proud and happy to learn about the exploit of our alumnus, Boris Yegorov, Hero of the Soviet Union, who as a member of a team of cosmonauts had taken part in an epic space flight.

These days the rate of progress in all areas of human endeavour is accelerating vastly. The Soviet medical profession along with the rest of the Soviet people are actively participating in communist construction. In this country the struggle for prolonging life expectancy, for safeguarding the health and fitness of Soviet people is regarded by the Government as a task of national importance. The CPSU and the Soviet Government are closely following the progress of medical sciences and stimulating it in every way. Huge funds are earmarked to support research.

We are living in the midst of a scientific and technological revolution. Medical science and the health services are being changed before our eyes. What was only a dream yesterday is now becoming part of the practical activity of health bodies; medicine is using the achievements in physics, chemistry, mathematics and engineering to probe the innermost secrets of living matter. We are now on the threshold of history-making discoveries in biology, akin to those that have already been made in physics and chemistry. Our time will go down in the annals of human history as the epoch of unlocking the secrets of living matter. Medical scientists and engineering experts working in close collaboration are but one step removed from making artificial systems capable of duplicating their living counterparts. We have reached a stage when the vital processes occurring within the human body are being studied on a molecular level. The advances made by molecular biologists who now have sophisticated equipment and measuring instruments open up breath-taking prospects for controlling vital processes, heredity growth and reproduction mechanisms, as well as promising important insights into the essence of the activity of the human brain. The younger generation of Soviet medical scientists and clinicians have unlimited opportunities for the application of

their talents and skills. The options are many and varied including research into the molecular principles of vital processes in norm and pathology, organ and tissue transplantation, the battle against cancer and other formidable diseases, control of viral and infectious diseases, etc.

The new challenging tasks facing Soviet medicine are making more exacting demands on the younger members of the Soviet medical profession. They are aware of the challenge and are fully prepared and equipped to meet it. They know that a successful medical scientist today is one who keeps abreast of the latest developments not only in his own particular field but in related fields as well. The same applies to the practising physician.

The Soviet medical colleges and other institutions training skilled medical personnel are adjusting their curricula to bring them fully in line with the demands of the time.

The supreme duty of the younger generation of the Soviet medical profession is to be worthy of their predecessors and carry forward the torch passed on to them by their teachers.

## REQUEST TO READERS

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